BEYOND EARTH DAY

The Cornell Greens *A Special Issue of* Science for the People *May, 1990*

Student Environmentalist Movement Blossoms Nationwide

It's bigger than anything since the legendary 60s. It stretches across the country, to 45 states and an estimated 1,000 campuses. It's the Student Environmental Action Coalition (SEAC), and it is galvanizing student activism on environmental issues on campus, in the community and in Washington. And it's starting to get noticed.

SEAC was founded in the Fall of 1988 by University of North Carolina Chapel Hill students Don Whittier and Blan Holmen. An initial call in *Greenpeace* magazine to form a national student network brought 200 responses, and plans for a nationwide conference. That conference, called "Threshold", was held last October at Chapel Hill. It drew 1700 students from across the country, representing over 600 campuses. Since then, organizers in every state have bolstered the network: 55 schools in New York, 20 in Florida, 208 in New England, and so on. Regional conferences have taken place in many areas: when SEAC co-sponsored a conference in New York with NYPIRG, 600 students came, making it the largest such gathering in a decade in New York. After Earth Day, SEAC merges with the Earth Day 1990 network, bolstering membership still further.

What does SEAC do? First and foremost, it connects student environmental groups to each other, to share ideas, tactics and support. Many state newsletters have sprung up, and the national newsletter has a subscription list of 1,000. Secondly, it connects them to groups they have traditionally been separated from—the national organizations

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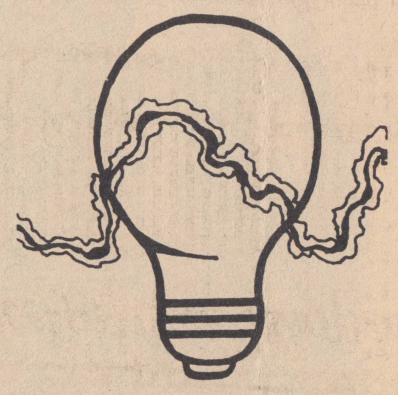
America's Energy Future:

Conservation and Renewables Are the Path to Take



Energy strategists in government and the utility industry tell us we are running out of cheap oil, the largest source of energy for the U.S. The question we ask then is: How are we going to get more energy? Our only realistic options, they tell us, are to increase the number of coal and/or nuclear electric power plants.

There are two serious flaws with this line of reasoning. The first is that if all the economic, social and environmental costs of energy use are considered, it turns out that nearly all our nation's energy needs could be satisfied less expensively with renewable sources such as solar, wind, flowing water, biomass and geothermal energy. The second, and even more serious flaw, is that we are asking the wrong question. What we should be asking is not how to get more energy, but how can we most cheaply continue to get the energy products we want, like T.V. and air conditioning. Far and away, the method for achieving these things with the least cost is to improve energy efficiency.

According to G. Tyler Miller, author of *Living in the Environment*, there are three general methods of energy conservation: 1) We can stop energy wasting habits such as lighting empty office buildings; 2) We can use less energy to do the same amount of work by making small, ultimately money saving investments like adding more insulation to homes and using fluorescent bulbs; 3) We can use less energy to do the same work. This would involve long term investment in developing more efficient devices like solar cells and better appliances.

Contrary to what many people believe, energy conservation does not have to mean walking everywhere instead of driving, sitting in unheated homes in the winter, or other so called "belt-tightening" activities. Rather, our greatest energy conservation could be achieved with "leak plugging" or simply eliminating pure waste and utilizing available, more efficient technology. Not only can leak plugging be achieved with little or no adverse effects on our standard of living, but it can have tremendous windfalls.

We have already gotten a taste of the savings that are attainable. Between 1975 and 1985, conservation measures, encouraged by the Carter Administration, saved the country an estimated $150 billion per year. New cars now go twice as far on a gallon of gas as they did in 1973. Refrigerators are 72% more efficient and the average home uses 25% less heating energy per square foot. Still, the U.S. remains the most wasteful nation on earth. We have only seen a tiny fraction of the energy savings that can be reaped.

A 1985 National Academy of Sciences study predicted that U.S. energy consumption could be cut in half by leak plugging alone. Tyler contends that by vigorously pursuing all three conservation methods, we can cut energy use per person by 80% to 90% by 2020. Amory Lovins, energy consultant and director of the Rocky Mountain Institute, believes we can quadruple electrical energy efficiency, "making it possible to run today's economy, with no changes in lifestyle, using no thermal power plants, whether old or new, and whether fueled with oil, gas, coal, or uranium. We would need only the present hydroelectric capacity, readily available small-scale hydro-electric projects, and a modest amount of windpower."

Skeptical? Consider these facts: the average home in Sweden uses 3 times less energy to achieve the same amount of heat as the average American home. Furthermore, we now have the technology to make new buildings, and many existing ones, so "heat-tight" that they need virtually no energy for heating or cooling, even in extremely hot or cold climates. We know how to make lights and household appliances that are 5 times more efficient than the ones currently in use. The Volvo LCP-2000 gets 63 to 81 mpg, seats 4, exceeds U.S. crash safety stan-

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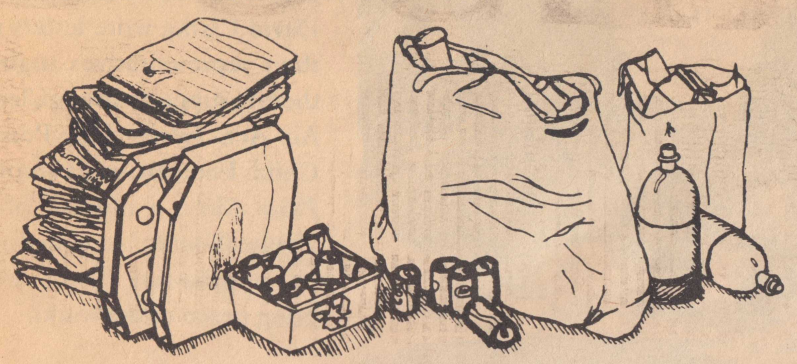
Recycling & Waste Reduction

Every day is Earth Day

Garbage is everywhere: in my kitchen, downstairs in the cans on the curb, littered along the street, overflowing in our local landfill. Everywhere. It was easy once; you threw your trash in the dumpster and forgot about it. There was no worry, no concern over where it went or how it would eventually be disposed of. Those days are gone. Garbage is one of the major environmental crises facing this country in the 1990s. It is an issue that all of us must face, on Earth Day and every day. What follows is a brief description of the solid waste crisis and a detailed summary of actions every American can take to reduce, reuse and recycle the waste that we produce.



The U.S. produced almost 158 million tons of trash in 1986. Of that, 140.8 million tons, or 89%, were landfilled or incinerated, while only 16.9 million tons, or 11%, were recycled. Americans threw away almost two billion razor blades, 1.6 billion disposable pens, and 246.9 million scrap tires in 1988 alone! In total it amounts to almost 1400 pounds of waste per person, or 3.5 pounds per person per day. That's twice the amount of waste per person than most other developed countries, and it's growing. Our plastic waste

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Ancient Forests in the U.S. Almost Gone Due to Deforestation

Preservation of all remaining biological diversity in intact ecosystems is the most important task currently facing humanity. Ancient forests (also legally defined under the term "old growth forests") in the U.S. constitute one of the richest ecosystems on earth. They are characterized by living trees, often 250 or more years old, with trunk diameters of 3 to 10 feet, a multi-layered canopy, broken tops and a coarse branch system. The forest also has standing dead trees (snags) and down trees on the ground and in streams. Because the huge trees are highly valued for timber, clearcut logging of the last remaining unprotected old growth forests on national forest land is occurring at the rate of 1,350 acres per week. One to 2 billion dollars a year of U.S. tax dollars is used to subsidize this clearcut logging in national forests which are administered by the U.S. Forest Service and the Bureau of Land Managment (BLM). The ancient forests are becoming so badly fragmented that it is possible that no viable stands will be left in the Pacific Northwest in less than 5 years.

The fate of the ancient forests will set an important precedent for most of the rich forest ecosystems on earth. For this reason the urgency of stopping the destruction of forests on U.S. public lands cannot be understated. If one of the richest nations in the world with a stated democratic government cannot preserve its last remaining unique and vastly rich native forests, then what chance do the forests in the rest of the world stand? They will fall; within 100 years only fragmented islands of forest will remain on the planet if we do not stop the destruction of all remaining U.S. public forests now.

Most of the remaining ancient forests are in the Pacific Northwest (Oregon and Washington) and Southeast Alaska, while smaller forest remains are located in California, Idaho, Montana and the Appalachian range in the eastern U.S. (In Canada similar deforestation is occurring in British Columbia.)

Most of the forests in the U.S. (72%) are held by private ownership. According to Tim Hermach in The Native Forest Protection Act,

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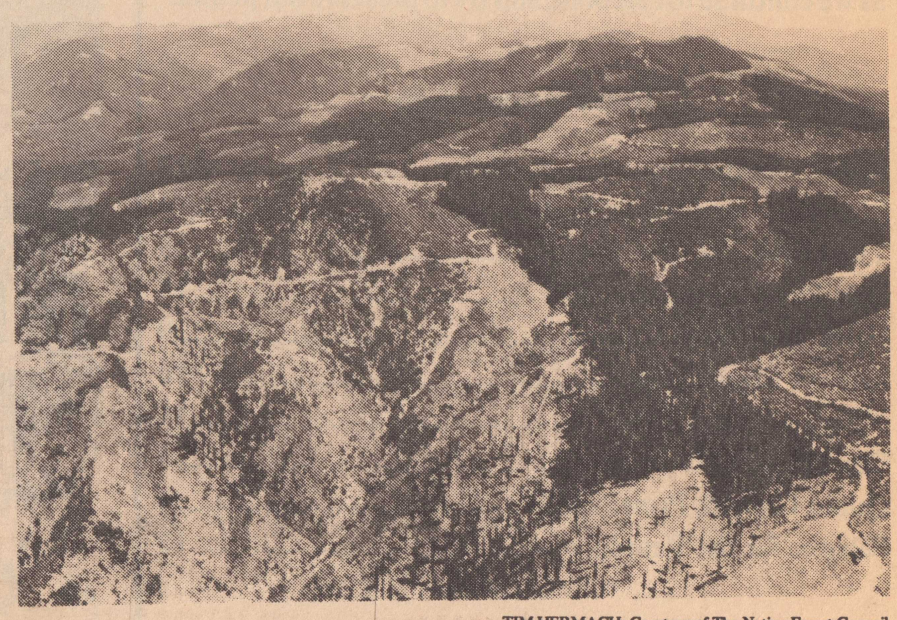

TIM HERMACH; Courtesy of The Native Forest Council

Logging and Roads Scar the Willamette National Forest, Oregon

BEYOND EARTH DAY

A Special Issue of *Science for the People*

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The environmental movement as it stands on Earth Day 1990 is indeed a complex scene, with few simplistic problems or unanimously agreed upon solutions. As a student environmental group, the Cornell Greens differ in their political viewpoints, especially in the arena of solving environmental problems both locally and abroad. Most importantly, however, the Greens do share a deep concern about the quality of our global environment. We agree that those areas of our planet and atmosphere that have experienced severe environmental degradation at the hands of humanity should not be compromised any further than is *absolutely* necessary (preferably improved), and that those areas that have remained relatively unaffected should remain immune from current civilization's unprecedented power to consume and destroy nature without considering long term consequences. Beyond those basic feelings, the Greens take some quite different approaches in outlining their individual ideas for environmental solutions, and a sample of these opinions are given in this special issue of *Science for the People*. In *Beyond Earth Day*, we welcome the exchange of varying ideas necessary for working toward clear solutions to the multitude of problems that we face as we continue to celebrate and try to preserve our planet.

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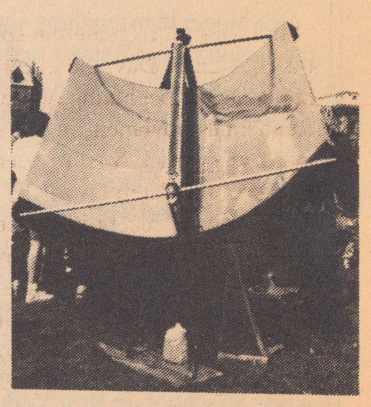
left: Non-competitive games: a child bounces on the Earth Ball; *below:* A concentrating solar boiler which generates steam for mechanical applications such as pumping, sawing, grinding and washing clothes.



Earth Day 1990 at Cornell

above: Kimberly Thompson screens-off water to make hand sheets of 100% recycled paper; *left:* Betsy Kessler and David Clarke write letters to their representatives urging them to support a strong Clean Air Act; *below:* The Peace Child Foundation performs *Peace Child*, a musical play about children who discuss environmental issues and bring peace to the world.

PHOTOS BY ELIZABETH DISSIN

Reflections on Earth Days Past and Future

In trying to recreate the spirit of the first Earth Day, the event often hailed as the beginning of the environmental movement in this country, I was struck by the sheer simplicity of that fateful April 22, 1970. My relatively recent indoctrination into modern environmentalism—the world of multitudinous facts, figures, percentages and projections—seemed to clash with my images of the emergence of Earth Day 1970. A conservationist Senator, a handful of concerned students and very limited funding managed to mobilize twenty million Americans out of their smog-induced sedation and into action 20 years ago.

All over the country, people weren't quite sure what "Earth Day" meant or how they were supposed to commemorate it, but somehow they did. Americans were sure that Earth Day meant something. In 1970, pollution was tangible: garbage filled the streets, smog permeated the air, foam and industrial waste floated in the lakes and streams. If for no other reason, the participants in Earth Day 1970 wanted to take the opportunity simply to clean up their mess. People collected their garbage into "Mountains of Shame," buried car engines in symbolic environmental funerals, walked wherever they had to go or just had a picnic in their favorite outdoor spot. They realized that Earth Day was a time to celebrate improvement, stress the need for change and collectively embark on another year of education and hard work.

The reason that in 1970, and perhaps more so in 1990, an Earth Day seemed so compelling was that many people appeared to be forgetting that every day of their lives is an "earth day." Even if shielded by impervious shelter for all 24 hours, each and every one of us must constantly be reminded of the delicate ecological balance that allows us to go on having this amazing thing called an earth day. As naturalist Henry David Thoreau once asked, "What's the sense of a house if you don't have a decent planet to put it on?"

Of course, as it becomes clear to us, the matter at hand is hardly a simple one. Global warming, deforestation, massive poverty and overpopulation demand effort and understanding that go far beyond the "America the Beautiful" theme of fledgling environmentalism in 1970. Since the first Earth Day, change has occurred, but at a rate which has been insufficient to avert the calamity that this planet may now be facing. In 20 years, we have come full circle. The disturbing realities of 1990 have called for a mass environmental mobilization of the type that has not been achieved since April 22, 1970.

Earth Day must serve to "force educate" a greater segment of the global population into action. We must now combine a realization of the fragility of the earth's environment and our place in it (a thought that can only be absorbed with pessimism) with the spirit of celebration and the very optimistic potential for change and improvement. It is only through this type of an Earth Day that we may gain the strength to do our seemingly insignificant part in combatting problems of such awesome magnitude. Once hundreds of millions of people around the world realize that they are not alone in their feelings of urgency, their "seemingly insignificant parts" will take on a far greater significance.

As the festivities of April 22 come to an end, we venture into the more uncertain realm "Beyond Earth Day." Now we must resume our work for change. On Earth Day 1970 Sidney Hower said of environmentalism, "The genius of it is that it is a movement in which individuals exercise their rights and powers as consumers, tax payers, shareholders, voters, scholars and citizens to bring about constructive changes." This sentiment is as valid today as it was in 1970. The only chance we have to begin remedying even the most tremendous environmental devastation is by making changes in our individual lifestyles, both in a private and a public capacity.

Though solutions to global warming, massive soil degradation, pollution and deforestation may seem far out of our reach, the roots of these problems are comfortably situated in our homes, cars and food. We provide the unmitigated demand for the products which ultimately threaten to destroy this planet. The feelings of urgency which brought us into action on Earth Day must be maintained. The information that has been disseminated to us must be utilized in order to reduce the demand that we create for those things that we have learned will harm the planet.

We must reduce our consumption

of fossil fuels by traveling less in our cars and by insulating our homes. We must limit the amount of garbage we produce by not buying overly packaged goods and by recycling. We must increase demand for recycled products, and curb the demand for virgin natural resources—trees that preserve the tenuous atmospheric balance of carbon dioxide and oxygen, provide for the planet's greatest source of diversity of species and embody some of the last bastions of refuge from humanity's encroachment upon every corner of the planet.

We must exercise our rights as consumers by identifying those industries that contribute to environmental destruction, and demand change by abstaining from buying their products. Each of these activities will undoubtedly take great effort to implement. However, our society can only begin the fight for survival by altering individual attitudes and behaviors.

The second component of individual activity is in the public sphere. The spirit of cooperation and mass participation that make Earth Day so meaningful must be maintained. Each individual must parallel their change to an environmentally sound lifestyle with involvement in some public capacity. We must lobby our politicians and compel them to create the political changes necessary to eliminate the global problems we face.

The originators of Earth Day 1970 could hardly have anticipated the magnitude of an environmental threat such as global warming, yet they created the perfect method with which to fight it. It is becoming increasingly necessary to have massive events such as Earth Day to maintain public awareness of global environmental issues. Overpopulation also represents a global issue which can only be curbed with the economic assistance of the developed countries and the cooperation of the lesser developed countries. Population growth will only subside if people throughout the world are made aware of the necessity for change, and pressure governments to work to these ends.

Ecologist Thomas Lovejoy has said, "I am utterly convinced that the great environmental struggles will either be won or lost in the 1990's and that by the next century it will be too late to act." Earth Day 1990 has ushered in a crucial decade in the fight for the preservation of the environment. If we do not follow the lesson that Earth Day has taught us—mass action can be used to educate and to foster change—then we may be headed for destruction. We must realize that this planet is able to sustain life only by way of a delicate ecological balance. If we value the relationship between the various elements of the ecosystem that provides us with the means for survival, then we must act now to correct the problems that threaten it.

Our society cannot allow Earth Day to become a hallowed shrine with no substance. Future generations must be able to look to Earth Day as a symbol of the ability of mankind to recognize the need for change and to successfully implement it. In the future, Earth Day must be a holiday of dedication to the work upon which we now embark. We must go beyond the events of Earth Day 1990 to establish a new environmental ethic; one that will continue to bring awareness and change far into the future.

— Gil Raviv

Green Philosophy and the New Environmental Ethic

We face the question of whether a still higher "standard of living" is worth its cost in things natural, wild and free. For us in the minority, the opportunity to see geese is more important than television, and the chance to find a pasque flower is a right as inalienable as free speech.

—Aldo Leopold
Land Ethic

Wilderness, wild things, beautiful, scenic, far away places—these are the things that come to mind when we think of "the environment." The environment is towering redwood trees and colorful birds, it's waterfalls and snow-capped mountains and fields of wildflowers; it's an Audubon photograph. But is that all there is? Is the environment merely 'out there'?

Is it only a place separate from us that we will protect best by staying out of or by sending its defenders a check in the mail? Despite the apparent need to preserve wilderness, I question whether this is enough. I wonder how we managed to develop such a strong environmental ethic for remote, unique wild places and simultaneously avoided concerning ourselves with the environment that surrounds us every day. Is it consistent to actively give money to a landscape we may never see and at the same time allow the space around us to become polluted and uninhabitable? It seems to me that if we can tolerate loss of beauty in our hometown, if we can justify wasteful behavior in our friends and ourselves, if we can live in a manner that directly pollutes the air we breathe and the water we drink, then we aren't making an honest effort to protect "the environment."

We are part of the environment. Nature is not to be viewed as an object with humans separate from it. The environment is an integral part of our everyday life and our everyday behavior. It is effected by the food we eat and the way we dispose of our waste; by the things we take pleasure in and the way we think about the world. Similarly, our lives are influenced by the environment. Culture is a reflection of our surroundings. Nature effects our community structure, our economy, our politics. Therefore, an environmental ethic should involve all aspects of our lives. Attempting to preserve the earth without this in mind is to ignore one of the most basic teachings of ecology: everything is connected. Certainly, that's a trite phrase, but sometimes phrases become cliché because they're true. Everything *is* connected.

Consider Chief Seattle's Address to the American President in 1855: "Humankind has not woven the web of life. We are but one thread within it. Whatever we do to the web, we do to ourselves. All things are bound together. All things connect. Whatever befalls the earth also befalls the children of the earth. Continue to

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I wonder how we managed to develop such a strong environmental ethic for remote, unique wild places and simultaneously avoided concerning ourselves with the environment that surrounds us every day.

Ozone Waffling Ends in Vermont as Tough Legislation is Enacted Banning CFCs

In an age of government loopholes, exceptions and compromises, Vermont has unabashedly moved to the forefront of the environmental action arena after passing a tough anti-CFC law that should prove to serve as model state legislation for years to come. Ozone-decaying CFCs (chlorofluorocarbons) will be phased out by 1993 in essentially all products that release the chemicals upon decomposition. The innovative new legislation results in minimal losses by consumers, industry and, especially, the environment.

Chlorofluorocarbons decompose in the atmosphere, giving off chlorine which in turn reacts with the veil of protective ozone (O_3) in the stratosphere. The ozone layer normally filters a substantial amount of the sun's ultraviolet radiation. Increased absorption of ultraviolet radiation at the earth's surface has been closely linked with skin cancer, and is suspected of weakening the immune system, inducing cataracts and increasing the possibility of birth defects. Crop damage and other potential effects on various organisms still need to be researched more closely, but are viewed by many biological and agricultural experts as realistic threats that would only compound human health risks.

Atmospheric analysts began discovering a significant "hole" (actually an increasingly substantial reduction in local ozone concentration) in the the ozone layer above Antarctica in 1974. The puzzling finding was the first indication that something was environmentally amiss in our atmosphere besides its filth. After years of speculation, extensive research has concluded that decomposing CFCs are a primary agent in causing the hole, another of which was recently suspected of "opening up" over a substantial portion of the Northern Hemisphere. Though such changes could occur over long periods of time, the hole has been increasing in size and intensity since its recent discovery, leading most to believe that industrial chemical emissions are responsible for the situation.

While these current effects alone are reason enough to cause Vermont legislators to act, what's worse is that a typical chlorine chemical can last up to 100 years in the atmosphere and react with unknown numbers of O_3 molecules, further destroying the ozone layer, an already quite thin constituent of the stratosphere.

CFCs are widely known to be in many aerosol containers and styrofoam packaging, but the major emitters of CFCs are refrigerators and air conditioners still using the dangerous chemicals. Some insulation and industrial solvents also contain the chemicals, but to a much lesser extent. With CFCs having such a powerful stronghold in many of the products, the Vermont legislature is attempting to balance between industrial and environmental concerns.

The single largest CFC emitter, automobile air conditioners, will be banned in Vermont in 1993-model cars, a date that Congress is now reviewing as a possible federal limit for automobile CFCs. It will be illegal to register or sell a car with a CFC-laden air conditioning system, according to the stiff law. To stem CFC release from older car air conditioners, automobile service stations will be required to invest in an already available technology by 1991 that can capture and recycle the CFC coolants in the vehicle's systems. To date, few stations have made the $2000-$4000 investment to buy the CFC-recyclers, according to Joan Mulhern, Vermont Public Interest Research Group Legislative Director, but will be reviewed on an individual basis next year.

Also included in the legislation are bans on CFC use in cleaning sprays, noise horns, propelled streamers (Silly String contains the villain) and most other CFC containers. Bans on these "more frivolous" CFC containers will take effect almost immediately, says Mulhern. For "more significant uses," like refrigerant CFCs, substitutes will be required after a "grace period" that allows producers time to find reasonable alternatives. While some CFC-producers are scrambling to find replacements for CFCs in their products, other industries are taking advantage of a linguistic loophole in the law.

"Part of the problem is that some of the companies that were formerly using CFCs are now using halogenated chlorofluorocarbons, or HCFCs," explains Mulhern. HCFCs are functionally good substitutions for CFCs, but unfortunately fulfill much the same role in the atmosphere that CFCs do. Preliminary research indicates that while HCFCs might be slightly less reactive than CFCs, they have a similar lifespan...far too long for comfort, particularly considering the fact that if the average lifespan of a CFC or HCFC molecule is anywhere near

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Recognizing the Threat & Valuing Biodiversity

Rosy (Madagascar) Periwinkle

When setting our priorities for addressing environmental and conservation problems, the first item on our list should be the preservation of biological diversity. Scientists today are busy with the difficult task of predicting impacts on the earth's ecological functioning by the mega-extinction of species that has already begun, and will likely continue. Without functioning ecosystems, other environmental problems seem relatively trivial in nature. Bryan G. Norton, an environmental philosopher, says that "concern for biological diversity, in a sense, is the most central value of environmentalism because other environmental goals such as resource protection, pollution abatement and so forth all depend upon the continued functioning of complex ecosystems."[1]

There are, however, many more reasons for protecting biodiversity. These fall into three main categories. In addition to its importance in maintaining stable ecosystems, biodiversity also provides direct benefits to humans in agriculture, industry and medicine. Most importantly, biodiversity is valuable in itself, independent of its usefulness to humans. Any of these three categories would be sufficient to show that our present destruction of biodiversity is wrong and should stop, but we are fortunate enough to have all of them to strengthen our case.

Without biodiversity, we would not have food, clothing or shelter, the three most fundamental requirements of life that agriculture supplies us with. All crops that we presently cultivate were originally wild. Corn was merely another plant species among about 250,000 others until it was discovered by Native Americans. The corn that we enjoy today, however, did not come into being quite so easily. It has been selectively hybridized with a large number of other wild ancestor corn plants which we are still discovering, and which improve the quality of our corn, permit greater production, and confer resistance to disease when selectively bred.

Corn also does not simply grow on its own. It requires the aid of soil organisms, plants which regulate the weather and moisture around it, insects which pollinate it and many more organisms with roles not yet discovered. All the technology and chemicals that we are able to use in our agricultural system will not eliminate the need of other species for successful crop growth.

When considering the importance that crops like corn hold for us today, it is interesting to think about the thousands of other plant species which could just as easily be cultivated, but are not for whatever reason. When these plant species become extinct, we are eliminating the possibility of ever using them. Imagine the opportunity costs involved in such a loss, when one considers that corn or rice or wheat could just as easily have been statistics in our list of extinct plants.

Finally, as we now look toward natural methods of farming as an alternative to chemical fertilizers and pesticides, biodiversity will be the source of these alternatives. Dr. Thomas Eisner of Cornell describes a new field of study which he calls chemical prospecting. This involves screening species for useful chemicals which can be used for many purposes. Dr. Eisner very recently found that an endangered mint plant in Southern Florida was faithfully avoided by almost all insects. Upon closer observation, Eisner found that the leaves of the mint plant were covered with small capsules filled with a substance which proved to repel insects.[2] The use of such plants or their chemicals may be able to replace dangerous, synthetic pesticides.

Chemical prospecting is not a new idea, however. Pharmaceutical companies have long been performing similar activities in their search for new medicinal drugs. We currently use thousands of drugs which were either originally discovered in plants and then synthesized, or are still extracted from their plant sources. The economic value of prescription drugs sold in the U.S. in 1980 containing at least one plant-derived chemical was estimated at $8.1 billion.[3] Only a small fraction of all potentially useful species have actually been screened for biological activity and medical applications. Cures for many modern diseases such as AIDS and cancer depend upon the success of screening programs.

An example of what biodiversity can offer to modern medicine is the story of the *Rosy* (or *Madagascar*) *Periwinkle*. This common houseplant was screened for potential anticancer drugs and was found to contain vincristine and vinblastine which were later found to achieve 99% remission for accute lymphocytic leukemia and between 50 and 80% for other forms of cancer.[4] Sales of these two drugs exceeded $100 million in 1980 alone.

Few of us realize the extent to which biodiversity benefits us every day. International Environmental Consulatant Norman Myers reminds us that "Unaware as we may be, we benefit from plant materials every time we apply a shampoo or sunscreen lotion, every time we paint a wall or varnish a table, every time we use a golf ball or a jet engine or oil-drilling equipment, every time we employ goods containing tinplate or glycerine and every time we allow the dentist to make a mold of our teeth or get the doctor to give us a vaccination or an immunization shot."[5] The rubber in our sneakers or our car's tires

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Bovine Growth Hormone: Separating Myth from Fact

Synthetic BGH (also called Bovine Somatotropin, or BST) is a drug designed to force cows to expend more energy on producing milk, and thus increase milk production by 10-25%. The primary manufacturers are Monsanto, Dow Chemical, American Cynanamid, Upjohn and Eli Lilly; it is manufactured using bacteria and recombinant DNA techniques. It is currently being considered for widespread commercial use by the FDA.

Because of human health, veterinary and economic concerns, BGH has become the focus of a major controversy. Since it is the seminal biotechnology in a whole range of products the industry hopes to introduce, the political and technical process by which is it being approved sets an important precedent. How democratic is our control of technology? Our farm policy? How much does industry influence our regulatory agencies?

At the time of this writing, Ben and Jerry's and several supermarket chains have agreed not to accept dairy products that have been treated with BGH. Wisconsin has already passed a moratorium on its use, and New York and Vermont are considering similar laws: New York has banned its use "until neutral experts agree it is safe."

At Cornell, a major center of research on BGH (largely funded by the Monsanto Corp.), students have been (without their knowledge) drinking milk from BGH-treated cows since 1986. The Student Assembly recently passed a resolution banning BGH milk from Cornell Dining and asking that only natural milk be served there. They have since backed down, however, partly due to pressure from Cornell President Frank H.T. Rhodes and partly on the basis of testimony from Cornell professors that BGH milk is harmless.

Why all the fuss? Isn't it true, as industry ads tell us, that "You've had BST and cookies all your life"? Isn't it just a helpful tool for dairy farmers? Wouldn't the FDA tell us if something was wrong?

Here is a sample of some major myths about BGH promulgated by the industry, the FDA and other proponents, and the holes in them.

MYTH: Synthetic BGH is the same as the natural BGH the cow produces herself, and has been in milk all this time. Synthetic BGH has up to 8 additional amino acids; the FDA has recently admitted that synthetic and natural BGH have up to a 3% structural difference. The Monsanto product also includes a methionyl group, which when added to human growth hormone greatly increases its allergenicity. Finally, there may be bacterial contaminants left over from the recombinant DNA manufacturing process of synthetic BGH.

MYTH: BGH milk is chemically identical to natural milk. Several independent studies have found that BGH milk has more fat and less protein than normal milk. In addition, increased sustained concentra-

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Specialized Environmental Studies Needed in Brazil

Last fall, The Cornell Greens were visited by Maria Thereza Alves, the Representative of the Brazilian Green Party (Partido Verde) to the U.S. She commented on the differences between the U.S.' environmental movement and Brazil's. First, Brazil's very survival depends on certain industries, and so environmentalists wanting to stop the destruction of rainforests there must do better than reject them; they must provide alternatives. Secondly, in the ranching country and rainforests of Brazil, there is no rule of law; it is controlled by guns and money. This means that just passing a law, so often our goal in the U.S., can have very little meaning.

She also brought with her a set of *Research Proposals in Ecology*, drafted by scientists convened by her party for the State of São Paulo, Brazil. These are research topics that Brazil needs help on. They are:

1. Epidemiological study of morbidity and agrochemicals.
2. Study of the environmental effects, damage and efficiency of pesticides in countries with a tropical climate. (Agrochemicals are tested and produced in the north for use in temperate and cold climates.)
3. What is the ideal treatment for vinhaça (sugar cane) since its use as fertilizer and in irrigation contaminates the underground aquifer?
4. Calculation of emissions of atmospheric pollutants caused by burning of sugar cane fields. Currently 2,600,000 hectares of sugar cane are burned annually in the State of São Paulo.
5. Technological risk. How can neighboring populations be accurately informed of the problems and consequences of an industrial plant as well as the risks experienced by workers and area residents?
6. Study of the environmental problem of the use of ethanol and methanol resulting from the combustion of alcohol. When alcohol is used as fuel there is a carcinogenic potential from the conversion of ethanol into aldehydes.
7. Billings Dam (on the Pinheiros river). Verification of the level of heavy metals in dam sediments and thepossibility of river recovery if the flow were to revert to its original course. Will these heavy metals be stirred up and transported? And in what quantity? Will the wetland area around the Billings Dam be damaged if the river resumes its original flow?
8. Identification of gross environmental indicators that reflect the level of contamination of organic toxic substances, such as industrial affluents and agrotoxins.
9. Study of the contamination of mangroves associated with soil use and disturbance of the aquatic fauna.
10. How to cultivate and manage a forest of mixed composition that is economically viable, including *Pinus*, quiri, araucaria, etc.
11. Effects of atmospheric pollutants on tropical plants, especially those of economic interest such as sugar cane, coffee, corn, soybeans, cotton and banana. There are few studies and few researchers in the area and massive industrial expansion into the interior of the State of São Paulo is compounding environmental problems. The State energy company (Compania de Energia do Estado de São Paulo) plans to install numerous thermoelectric plants in Paulínea. How much SO_2 will be produced, and what will be the negative effects on the area's large sugar cane plantations?
12. Underwater emissions. Producers of emissions are not selective—they mix urban and industrial refuse. Is the current system adequate?
13. Research into low cost equipment for desulfurizing petroleum, to lower the emission of sulfur dioxide.
14. Survey to analyze the cost/benefit relations of garbage recycling vs. incineration vs. sanitary landfill.
15. Use of water resources, taking into account the environmental impact and concentrating on the preservation of wetlands and small farms. What is the best institutional organization?
16. Study concerning the formation of photochemical oxidates in the use of alcohol as a vehicular fuel. The equipment now used in Brazil must be imported and is of a high level of sophistication.
17. Study of the environmental impact of stabilization pools for sewage treatment. Does Brazil's ample land area, availability of solar energy and the low operating cost make this technology advisable?

Connect researchers in relevant fields to the real world problems Brazil is facing. Tell faculty about these proposals, and get them to work on them. For more information on how they (or you) can help contact Partido Verde (Green Party), Rua Pinheiros, 1361, São Paulo, SP Brasil, CEP 05422, (011) 814-2992.

— Cris Moore

Has the population bomb been defused?

In recent months, numerous environmental issues have grabbed the headlines as crises the U.S. needs to deal with immediately. Ideally, the Bush Administration would be able to identify and address an issue which lies at the root of several environmental problems. Indeed, there is such an issue—overpopulation.

The nations of the Third World face a population situation on the brink of disaster. Since 1960, the lesser developed nations of the world have added more people than the total populations of North America, Europe, the Soviet Union, Japan and Oceania combined. For example, Nigeria, with an already crowded population of 105 million, is projected to grow to 301 million by the year 2025. Similarly, both Mexico, from 85 to 150 million, and India, from 819 million to 1.5 billion, are also expected to experience substantial growth in the next 35 years. Many other countries in Latin America, Africa and Asia also face runaway growth situations.

Many of these nations already have difficulty in providing adequate food, housing, health care, education and employment for their populations. With a doubling and tripling of their populations almost certain in the next half-century, these nations' problems are going to explode into crises of serious significance. Food shortages and famines, such as that currently faced by Ethiopia, will become commonplace, as nations attempt to eke out sufficient crops from the little land not occupied or already ruined by overgrazing and overplanting.

Such food shortages will increase the pressure to turn precious forestland and marginal grazing land to usable earth, and greatly worsen two global environmental problems—deforestation and desertification. Much of the tropical rainforest cut down is converted to land for subsistence agriculture. Similarly, growing crops and grazing cattle on semi-arid dry lands destroys what little water-producing foliage exists, and turns the border land effectively into desert. As the numbers of people dramatically increase over the next decades, crises of deforestation and desertification will continue to grow.

By far the most effective method in dealing with population growth is family planning. It is estimated that by tripling the $2.5 billion spent today on family planning in developing nations, the average birth rate could be reduced to below replacement level. The Reagan and Bush Administrations have repeatedly vetoed funding proposals to the international aid organizations, such as the Agency for International Development and the International Planned Parenthood Federation, which provide education and birth control to women around the globe, on the grounds that such monies may be spent on coercive family planning, including abortion.

President Bush should propose new funding to these relevant organizations for several reasons. First of all, the funding could easily exclude China, the only nation found practicing coercive policy. Secondly, if women everywhere are properly provided with the contraceptives and health care the programs promote, the number of both unwanted pregnancies and abortions will certainly shrink.

In conjunction with funds for family planning, aid to developing nations has to include other efforts to provide equal opportunities for every person on earth. This can include Third World debt relief, fair trade, a foreign aid program aimed at the poorest of the poor, full support for United Nations population programs, and real support for Third World self-determination.

The time is now to act to lead the world into a sustainable future. By funding global family planning and development programs, the U.S. could be at the forefront of an effort to stem overpopulation and the ecological problems which invariably result. Dealing with the major cause of many of the more highly publicized issues would finally signal a concentrated effort on the part of the Bush Administration to deal effectively with the environmental problems facing our world.

— Matthew Pacenza

the harrior

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America's Energy Future

continued from page 1

dards, has better acceleration than the average American car and could be mass produced for the same price as the average small car.

Not only is the technology out there, it is unbelievably cheap because it more than pays for itself in energy savings. Weatherstripping, heat exchangers, greenhouses, superwindows and other insulation devices cost about half a penny per kilowatt-hour of energy saved. The average cost of electric power in 1987 was 8 cents/kwh, 13.5 cents/kwh for nuclear power. Current technology for improving the electrical efficiency of motors, lights, appliances and industrial equipment costs about 0.6 cents/kwh. Taking advantage of this technology could save 75% of all electricity used, according to Miller. That is more than 4 times the electricity produced by all of the nation's 100 plus nuclear reactors. Our national energy bill would be cut by $200 billion a year, if we were only as efficient as Japan or Sweden.

Energy conservation means we need less energy to do the same work; this means fewer and smaller environmental impacts of energy use. For example, improving efficiency by only 2% per year would reduce CO_2 emmisions by 50% over the next 40 years. It also means improved national military and economic security due to reduced dependence on foreign oil and the need for military intervention to protect sources of oil in the Persian Gulf and elsewhere. And what about the people conservation will put out of work? It turns out that efficiency provides more jobs than it costs. Each big power plant that is shut down frees up enough capital for other sectors of the economy to provide 4,000 new jobs.

Of course, conservation does not entirely remove the need for other forms of energy, but renewables are the best way to meet our energy demands. Despite the fact that government policy has heavily favored development of nuclear and fossil fuels, many renewable technologies are now competitive or will be in the near future (see table). Biomass (organic plant matter), geothermal (heat from the earth's molten core) and hydroelectric are now economically viable electricity sources. Solar thermal (focusing sunlight on a heat collection device to run electric turbines) and wind power are cost effective in some areas. Photovoltaic cells, thin wafers that convert sunlight directly to electricity, are expected to be competitive by 2000.

Besides the obvious advantage of being available to us indefinitely, renewable energy sources have the distinct advantage over coal and nuclear sources of coming in many forms, not just electricity. Biomass can be used to produce gasohol, ethanol and synthetic natural gas. Wind power is good for pumping water and solar energy is best for direct home heating. As Amory Lovins points out, our most severe energy problems are in the areas of transportation and heating for which electricity will never be an economic solution.

The U.S. consumed 83 quads (quadrillion British thermal units) of energy in 1988, 8.6% of which was from renewable sources. The Department of Energy's Energy Research Advisory Board reported in 1985 that with sufficient research, renewables could *competitively* provide up to 80% of the national demand by 2010, or about 90 quads. Public Citizen, a consumer advocacy group, contends that the rewards in terms of viable renewable technologies are virtually guaranteed if the government would only allocate as much for Research & Development as it now does for nuclear research.

Yet the Bush Administration, like its predecessor, ignores the potential for sustainable sources and continues to push for coal and nuclear. The Reagan Administration cut the R&D budget for renewables by almost 90% from about $1 billion in 1981 to $116 million in 1989. In 1990, President Bush cut the figure to $86.5 million while spending over $1 billion on nuclear R&D.

The tremendous environmental advantages of renewables over nuclear and fossil sources are obvious. Extraction, transportation and consumption of coal, oil and natural gas leave millions of gallons of spilled oil on our beaches, clouds of smog over our cities, acid rain in our forests and lakes and so on. Of course, fossil fuels depositing billions of tons of CO_2 into the atmosphere are directly responsible for the possibility of global warming; coal is by far the biggest culprit per unit of energy. As for nuclear power 30 years after the start of the nuclear power program, there is still no proven safe method for storing spent fuel that remains radioactive for hundreds of thousands of years. Toxic waste continues to pile up in hundreds of locations around the country.

Past, Current and Projected Electricity Production Costs of Newly Constructed Renewable Electric Technologies (in 1989 constant dollars)

	Cost in cents/kwh		
Electric Technology	**1980**	**1989**	**1995/2000**
Biomass	5	5	5
Geothermal	4-8	4.5-5.5	4-6
Hydroelectric	–	3-6	3-6
Photovoltaics	150	20-40	6-18
Solar Thermal (parabolic trough)	24	8-12	5
Wind Power	25	7-9	4-5
Nuclear	–	13.5	–
U.S. Average*	–	8	–

*includes coal, oil & natural gas

Source: Public Citizen, based on government and industry data

Energy use and the current debate over increasing coal or nuclear energy production is like cutting a stick of butter with a chansaw and arguing over how to build a bigger chainsaw when a simple butter knife would do the job quite nicely.

While renewables could easily be competitive on a large scale using traditional methods of comparison (market price), they become even more attractive when the external costs are accounted for. Many social, economic and environmental costs simply do not find their way into the cost to consumers. In 1984 the government gave $44 billion in direct subsidies to the energy industry (over 90% went to non-renewables). More is spent indirectly. For example, if the cost of military intervention to maintain the supply of oil from the Persian Gulf since 1985 were included in the price of that oil, it would cost $495/barrel, not the $18/barrel that we pay today.

Nuclear power has the highest external costs of any alternative. Utilities have received over $9 billion worth of free uranium enrichment services from the Department of Energy. Utilities now pay less than 10% of what will be the ultimate waste disposal cost, according to Public Citizen. Neither has decommissioning, which may cost as much as $1.3 billion/plant, been included in the price of electricity. Furthermore, the federal government has agreed to assume liability for any serious accidents. The Sandia National Laboratory estimates that such an accident would cost taxpayers at least $126 billion. The Nuclear Regulatory Commission says the probability of a severe core meltdown at one of the reactors operating in the U.S. during the next 20 years may be as high as 12% to 45%.

A study performed by Olav Hohmeyer in 1988 for the Commission of the European Communities incorporated some of the externals in a comparison of electric power costs from fossil fuels, nuclear, photovoltaics and wind power. Hohmeyer included direct government subsidies, general economic effects (such as employment) and environmental impacts as quantified by their direct costs in terms of human health care, agricultural output loss and building corrosion. The study found that if these external costs were included in the cost to consumers, photovoltaics would now produce electricity 3 to 9 cents/kwh cheaper than fossil fuels and 7 to 16 cents/kwh less than nuclear. Wind power is 3 to 6 cents/kwh less than fossil electricity and 6 to 14 cents/kwh less expensive than nuclear energy. No such study has been undertaken in the U.S.

Wait a minute! If conservation and renewable energy are such good deals, why aren't they being used more? At least part of the answer has to do with deep-seated but obsolete attitudes about how to solve energy problems in this country. Energy use and the current debate over increasing coal or nuclear energy production is like cutting a stick of butter with a chainsaw and arguing over how to build a bigger chainsaw when a simple butter knife would do the job quite nicely. Another reason is the undue political influence exercised by powerful sectors of the economy, such as oil companies, car manufacturers and the nuclear power industry, who have a tremendous vested interest in preserving the status quo.

As individuals, we tend to evaluate our purchases on sticker price, not in terms of lifetime costs. For example, superinsulated houses generally cost 5% more than conventional ones and are therefore avoided by consumers. But the additional cost is paid for within the first 5 years and can save a homeowner $50,000 to $100,000 over a 40 year period. We need to adopt a long term view.

As a nation, we must demand that congress and the president change the direction of U.S. energy policy. The government should promote those energy options with the least overall cost to society. Such costs include social and environmental impacts. Only then will energy efficiency and renewable technology achieve the prominence they deserve.

Oil spills, smog, toxic waste, acid rain and global warming are constant reminders of the price we pay for technology and progress. Ironically, technology has also provided us with the answer to our energy problems in the form of conservation techniques and ecologically safe renewable energy sources, but we refuse to open our eyes and implement these solutions. In the immortal words of filmmaker Spike Lee, it is time to "WAKE UP!"

— Jeffrey S. Ross

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Global Warming's Potentially Tragic Effect on Fisheries

"We sure could use a little global warming today!" shudders a woman to her friend at a bus stop on a frigid and blustery day in January. Such light-hearted sentiments are often heard in places like Ithaca, New York, when walking across the Cornell campus can be an adventure in arctic survival. Although at times the idea of "a little global warming" may seem refreshing, it is probably not such a wonderful idea when one considers the actual environmental and societal implications.

Most people have a basic understanding of the phenomenon behind today's hottest topic, "the greenhouse effect." The earth's atmosphere is comprised of many gases, some of which absorb infrared radiation (heat) which would otherwise be radiated back into space. Of course, life as we know it could not exist on Earth without these "greenhouse" gases; ambient temperatures would be too cold to sustain life. However, since the Industrial Revolution, humans have raised the concentrations of these gases (primarily carbon dioxide) to the point where many scientists believe we will bring about profound changes in our world's climate.

Scientists are just beginning to understand what a changing global climate would mean for the earth and its inhabitants. By the middle of next century, it is anticipated that the global average temperature will have increased by 3.0 to 5.5 degrees Celsius (Schneider, 1989), and that higher latitudes will see a greater increase in temperature than equatorial regions (Mitchell, 1989).

But a great deal more than changes in temperature are expected to occur. An overall increase in global precipitation is anticipated, as higher temperatures may increase evaporation, condensation and rain; however, this is likely to be coupled with summer continental dryness (Smith and Tirpak, 1989), which may have severe adverse impacts on agriculture in some areas, particularly the U.S., western Europe, southern Asia (Smit et al., 1988) and sub-Saharan Africa (Pan-Earth Project, 1989). Availability and quality of water will likely change in many areas, often for the worse (Chagnon, 1987). Many natural ecosystems may be affected adversely by global warming; for example, boreal forests may experience massive die-outs because of dramatic temperature increases (Anon., 1989), and coastal wetland ecosystems may fall victim to sea-level rise, and, unable to migrate inland, may disappear (EPA, 1988).

In spite of the many "losers" in the global warming arena, there are also likely to be some "winners." For example, areas of Canada, northern Europe and the USSR may benefit agriculturally from climate changes (Smit, 1988), and in natural systems, species shifts may occur in which certain species are favored by new climatic conditions.

These predictions represent our "best guess" to date regarding the fate of some important resources in the event of global climate change. However, most systems, including climate itself, are not yet well enough understood to be able to make detailed, regionalized predictions. What is known is that there is much cause for concern; a change in global climate will have significant, and at times devastating, effects on the natural and anthropogenic systems of the world.

One important system which has received little study with respect to climate change is that of marine and freshwater fisheries. Fish are an important food resource for many of the world's people, with some areas and cultures relying on them almost exclusively as a protein source. A study is currently underway at Cornell to attempt to assess the potential impacts of global climate change on the world's fisheries. This article will summarize some of the preliminary findings of this study, and in doing so, illustrate the complexities and uncertainties involved in determining the fate of resources in a climate change scenario.

A fundamental assumption of this research is that global wind patterns would be significantly altered. Because a greater degree of warming is expected to occur in higher latitudes, the latitudinal temperature gradient would decrease, i.e. the temperature differential (and therefore the pressure differential) between latitudes will be reduced. Pressure gradients determine global circulation in the form of winds, which transfer energy from the equatorial regions toward the poles. Therefore, a lessened pressure gradient would result in a net decrease of wind energy imparted to the world's oceans and freshwater systems.

Winds are the driving force in the mixing of the world's oceans, and an important factor in the mixing of freshwater systems (Nixon, 1988). This mixing provides exchange of surface waters with water in deeper layers, and in doing so, serves to "stir up" nutrients and metabolic gases which accumulate on the bottom into the upper areas of the water column. In addition, mixing distributes solar energy from the surface layers into the lower layers, bringing heat into the bottom waters.

Distribution of nutrients and solar energy are important factors in determining fish production (Nixon, 1988). Distribution of nutrients determines the location and availability of plankton and other organisms which comprise the main food sources for fish, and therefore influence fish growth and abundance. Mixing of thermal energy creates layers of water which are thermally "stratified," or separated due to differences in density, while mixing of phytoplankton into the euphotic zone (where light energy can be obtained) allows for phytoplankton growth.

Changes in wind patterns, and therefore in distribution of nutrients and solar energy, would certainly affect fish populations. Examples of questions being addressed by the Cornell study include: 1) Would less wind mixing result in less mixing of nutrients from bottom layers into the water column, and therefore a reduction in fish populations which inhabit the upper layers? 2) Would less wind mixing result in stratified surface layers being shallower, creating a smaller "living space" and more food competition for fish living in these warmer layers? 3) Would phytoplankton growth decrease due to reduced transport into the upper layers, and therefore less availability of sunlight, potentially affecting fish growth?

Other potential impacts to fisheries could be brought about by the direct and indirect effects of an increase in water temperature, which would ultimately occur under a global warming scenario. One existing hypothesis indicates that bacterial action in aquatic systems is extremely important in determining the prevalence of benthic (bottom) biomass, and that bacterial action increases with increasing water temperature, thus consuming organic matter in the water column, and reducing the amount of organic matter to reach the bottom (Jones, 1982; Mann, 1976). Under this hypothesis, colder waters can potentially have a greater benthic biomass than warmer waters (as is seen in the "mucky"-bottomed temperate waters). This could mean that warmer waters brought about by global warming might see a reduction in benthic biomass, including commercially valuable species like lobsters and shellfish.

Other effects might be seen from an increase in water temperature. Some studies show that during periods of warming, some fish species have migrated northward into cooler waters (Clark, 1975; Cushing, 1978) One concern raised by the Cornell study is that it is possible that some food sources may not migrate with them, and that new food sources may not be as well suited, perhaps affecting the viability of the migrating fish populations.

Another hypothesis that raises concern is the "match/mismatch"

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The Facts Behind the Greenhouse Effect

Would I surprise you if I said that the "Greenhouse Effect" is a natural phenomenon, much older than the human species, thanks to which we enjoy an average temperature of 59°F on the Earth's surface instead of 0°F? Well, it's true! Here is how Lutgens and Tarbuck describe the process in *The Atmosphere: An Introduction to Meteorology*:

"The Earth's surface absorbs about half the solar energy that strikes the top of our atmosphere. Then the surface reradiates most of this energy skyward (terrestrial radiation) at a new wavelength. The atmosphere absorbs terrestrial radiation rather efficiently and warms up from lower to higher layers during the day. Primary absorbers of terrestrial radiation in the atmosphere are clouds, water vapor and carbon dioxide (CO_2). (Greenhouses use a different property to warm up: they restrict vertical motions of heated air. We therefore use the term 'greenhouse effect' mistakenly.)"

In the long run, incoming solar radiation equals outgoing radiation lost to space. Unfortunately, modern man has upset this equilibrium, mostly by burning oil and coal. Humans have increased CO_2 concentrations in the atmosphere by 25% since 1958. In addition, we systematically destroy rainforests which naturally absorb CO_2.

Excess CO_2 in the atmosphere accounts for about half of the offset in the Earth's energy balance. There are three other gases that trap heat in the atmosphere: methane (CH_4), nitrous oxides and chlorofluorocarbons (CFCs). We produce CH_4 by burning wood, producing rice and raising cattle. Using chemical fertilizers and cars yield nitrous oxides. Finally, CFCs exist in refrigerators, sprays, air conditioners and styrofoam products.

EXPECTED WARMING

Most scientists predict a minimum temperature rise of 0.6°F per decade. They see an average *global* increase of 3° to 8°F before 2050. They believe that the warming will be greater at higher latitudes and in the winter.

Clearly, such increases will be outside the experience of our species. Furthermore, they will be more abrupt than any other long-term temperature change in the past.

A NASA-sponsored climate model has provided predictions that may give a much better idea of the changes awaiting us. The model shows that if CO_2 concentrations double (at present growth, in 40 to 75 years), Washington D.C. will get temperatures over 100°F 12 days per year instead of the usual average of 1 day per year. Omaha will get 20 days over 100°F instead of the present 3 days per year. Similarly, both cities will get temperatures over 90°F 85 days instead of 35 days per year. [Data from Alan Robock, "The Greenhouse Effect," *Special Report*, September 1987.]

The results? Seas will rise because of thermal expansion. Glaciers and ice sheets may partially melt. Sea levels will thus rise 1 to 4 feet in the next century, potentially threatening the homes of 25 to 40 million people worldwide, according to *Newsweek*'s article "The Endless Summer?" (September 11, 1988).

Climate variability is expected to increase. Destructive weather in the form of droughts, floods, heat waves and hurricanes will become more common, with an impact on agriculture and civilization. With a greater temperature increase at higher latitudes, temperature differences between the tropics and other latitudes will drop. It is those differences that drive global circulation—winds, ocean currents, patterns of rain and snow. One theory says that the Midwest and southeast U.S. will become hotter and drier than the rest of the nation, possibly increasing human mortality. The Great Lakes will gradually evaporate. The American West is expected to receive less rain, too, with the Colorado River's annual flow dropping about 40%. The corn and wheat belts could suffer. On the bright side, parts of the USSR, Scandinavia and Canada will enjoy a longer growing season. However, longer and warmer summers will bring plagues to northern forests. Tropical regions, as well as insect-borne illnesses, will spread to temperate zones.

Water is expected to become more scarce, because of decreased precipitation over land. Increased need for groundwater will deplete aquifers even more rapidly than today. In addition, a sea level rise will flood a large number of aquifers and reduce water supply quality.

Even the hope that more CO_2 in the atmosphere would fertilize plants has proved futile. Experiments show that in some cases pest plants, like weeds, benefit more than the crops, or that additional growth is more in the inedible part of the plant.

ILL OMENS

Worried scientists warned us about the greenhouse effect long before we became aware of it. Only after a blistering hot spell in the Midwest and some disturbing climatic findings did the rest of us awaken. Ironically, the heat wave two summers ago might only be a random meteorological observation and could have nothing to do with the greenhouse effect. Still, it seems to follow a general trend: Of the 10 warmest years on record, 6 belong to the '80s, with the first 5 months of 1988 being the warmest on U.S. record. Since 1880, the average global temperature has increased more than 1°F and this average has gone up just under 1°F in the last one and a half years alone. Furthermore, sea levels have risen by about 4

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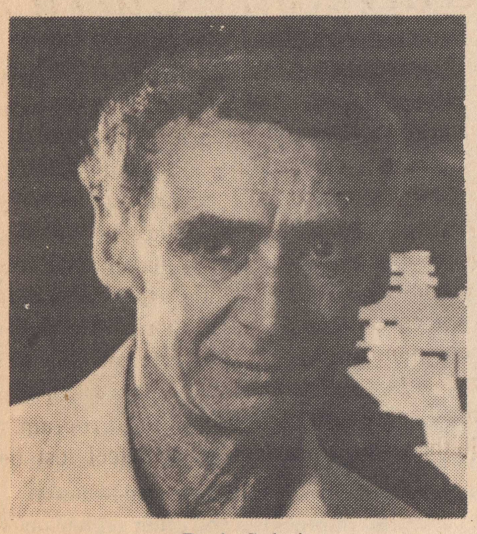
Arcosanti: An Urban Laboratory



Paolo Soleri

Most people are quick to point out the world's environmental problems, but how many offer workable solutions? Paolo Soleri, an Italian born architect, not only proposed a solution but put it into action. Detesting the excessive waste and ugliness of modern urban sprawl, Soleri conceived Arcosanti—his dream city. Arcosanti is a prototype *arcology*, an energy-efficient urban alternative being built by the Cosanti Foundation near Cordes Junction, Arizona, 65 miles north of Phoenix. Arcosanti is both a goal in itself and a learning process.

The term *arcology*, one of several words coined by Soleri, is a combination of the words *architecture* and *ecology*. It "points to the interdependence of the two: the human abode within the planetary abode." Expounds Soleri, "Arcology concerns itself with resources in the environment and the evolution of the human spirit. Today there is little doubt that our energy appetite must be curbed in order to construct the new towns needed to accommodate the expectations of an expanding population. Arcosanti seeks to offer an alternative to current urban dilemmas and at the same time seeks to reestablish contact both between people and with an undisturbed landscape. Arcology is a methodology that recognizes the necessity for the radical reorganization of the sprawling urban landscape into dense, integrated, three dimensional towns and cities. The city structure must contract and miniaturize in order to support complex economic, social and cultural activities, to reestablish a viable interdependence between living nature and man's ever increasing, uncontrolled and ecologically irresponsible consumerism, and to give individuals a new perspective and a renewed trust in society and the future. A major tenet of Arcology is that the city is a necessary instrument for the evolution of the human spirit (civil-ization)."

Construction began in the 1970s, and since then a large number of students and professionals have volunteered their time and energy to help build the earth-formed concrete structures that comprise the Arcosanti complex. As of 1990, however, it is only 3% completed. The Cosanti Foundation, "a nonprofit educational organization established in 1965 [by Soleri and his wife Colly] to conduct architectural and urban planning research," receives no government or private funding for Arcosanti construction. Thus the continuance of Arcosanti relies entirely on voluntary labor and/or donations, workshop and visitors' fees, and the sale of Soleri Windbells. The ceramic and bronze bells, designed by Soleri, are individually handcrafted by making a negative engraving in silt and pouring in clay or molten bronze, and are sold at the Arcosanti visitor's center and at Cosanti, Soleri's gallery in Scottsdale.

Situated "on a mesa overlooking a dry riverbed valley and facing cliff," the city, when completed, will occupy only 10 out of 860 acres of land owned by the Cosanti Foundation. The remaining acres, along with an additional 3200 leased from Arizona State, will preserve the natural beauty of the Arizona desert. Yet in this minimal amount of inhabited space Soleri plans to house approximately 5,000 people, while providing each family unit with an apartment space consisting of 2,000 square feet and 20-foot ceilings, which may be decorated and modified as each resident sees fit. Clustered in one 25-story-high structure, the apartments will constitute both home and workplace, thereby personalizing the concept of work and fostering a highly interactive society. The extraordinarily high population density will be achieved largely through what Soleri refers to as *miniaturization* ("...the rigorous utilization of all resources—mass-energy and space-time, for example..."), and, especially, the elimination of automobiles and the massive amount of attendant space they require. As is the case presently, a parking lot outside the city would accommodate visitors' cars, and car pools could be organized for trips to Phoenix or elsewhere.

At first glance, the city is not particularly striking. The tan, wholly geometric structures sit in the middle of a mostly flat, barren desert, with a distinct and slightly sterile futuristic look. But a tour quickly reveals the hidden beauty of Arcosanti and the amazing efficiency underlying its plan. The entire city faces south. Energy rising from extensive greenhouses to be built on the slope in front of the city will be trapped in wind tunnels running through each structure and ultimately converted into heat or air conditioning as the season warrants. Numerous half-domes (all facing south) will provide a naturally heated and lit space during the winter when the sun's trajectory is low in the sky, and a pleasantly cool and shaded area during the hot Arizona summer when the sun passes directly overhead. What is termed garment architecture will also be employed. In lieu of the traditional covered roof, a transparent membrane is laid over spaced beams, trapping the heat and light from the sun in winter. In summer, a white cheese cloth is laid over the membrane, thereby deflecting the sun's energy and keeping the inside cool. A variation on this theme is the use of vines which grow large and lush during summer and are bare in winter, blocking and admitting heat respectively.

Arcosanti is not merely about energy efficiency, however. It is also about *building* efficiency. Soleri designs his structures to be multi-purposed. For example, one of the half-domes which serves as the vaulted ceiling to one of several amphitheaters is stepped on the outside and forms a sky theater where one can watch the stars or a laser light show which a current resident of Arcosanti occasionally projects upon the opposite mesa, creating the illusion of dancing petroglyphs.

Although Arcosanti is designed to be self-reliant and highly energy efficient, it does not intend to be self-sufficient. "The idea of developing anything that can do without other things is extravagant and devoid of sense," writes Soleri. "A degree of autonomy and of self-reliance are more sane propositions, as they tend to discount arrogance on the one side and irresponsibility-parasitism on the other." In practice this means that not *everything* will be provided at Arcosanti. For instance, there are at least three excellent, well-equiped emergency health facilities in the nearby Phoenix area; it would be illogical and impractical to attempt to mimic them within the limited space and budget of Arcosanti. Medical care on a smaller and more personal scale, would, of course, be available.

In addition to the ongoing construction, Arcosanti offers a number of programs. The Arcosanti workshop is a five-week "learn by doing" program in which after a week of seminars devoted to the theories and philosophies behind Arcosanti, participants take part in the construction of the city and/or the production of the windbells. At the conclusion of the workshop, participants are welcome to become residents of Arcosanti and apply for employment. Arcosanti Construction Fellowships are available for students of architecture. In addition, there is an agriculture program, elderhostel activities, The Colly Soleri Music Center and The Minds for History Conferences, a series of public interviews and group discussions with some of the most influential minds from a variety of fields, including social and physical scientists, philosophers and artists.

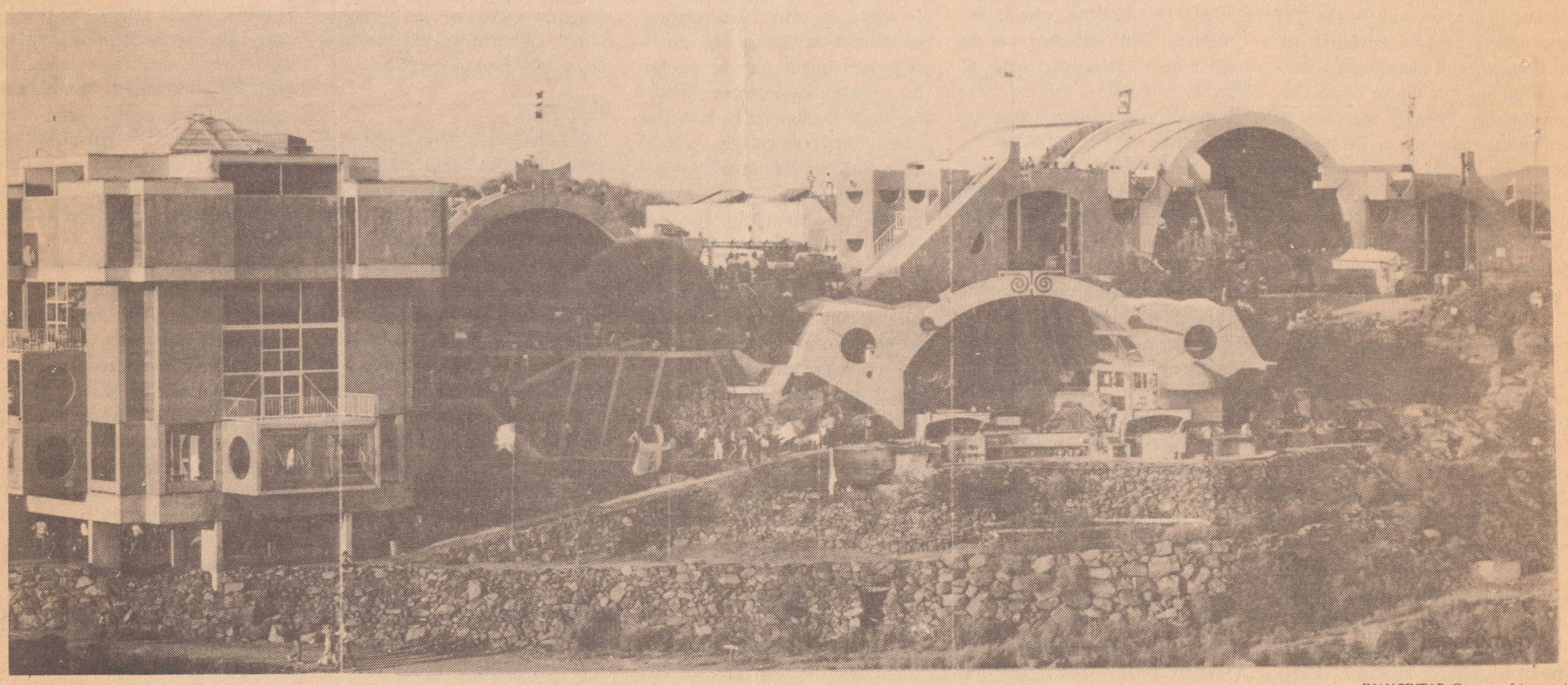
While Soleri deplores the "sprawling, low-density, energy-inefficient cities of one-family homes," he is far from being anti-city. In fact, Soleri views the city as "a step in the spiritual evolution of life on Earth...a 'necessary instrument' if mankind is to reach its ultimate potential." Nor does he contend that the city is necessarily opposed to a naturally functioning ecology: "True conservation is impossible on a planet that denies the city, but the existence of the city/town is dependent on ecological sanity. Indeed, a healthy ecology is dependent on the existence of centers of life so intense as to retain within its boundaries (city/town) the bulk of the planetary population and its paraphernalia. The converse is equally true. Once the city loses sustenance from the countryside, the city is doomed." "At its most basic level a Soleri city is a living 'organism with a thousand minds...contained in a mineral structure,' a being functioning as an entity while the city's inhabitants also function individually."

Arcosanti is one of many arcologies Soleri has conceived, detailed drawings of which were published in *Arcology: City in the Image of Man* (now out of print, but available in some libraries). He envisions numerous arcologies all over the globe, all linked via some kind of mass transportation system. But Soleri's visions get even more spectacular (though admittedly less likely): *Novanoah*, a 6,800 acre, 400,000-person, floating, ocean-based city; *Stonebow*, a 200,000-person city built as a bridge across a canyon; *Hexahedron*, the ultimate in population density with 170,000 people living within two connected crystalline pyramids 3,500 feet in height but occupying less than half a square mile; *Infrababel*, partially underground and housing 100,000; and *Asteromo*, a 70,000-person city in space "designed like a giant lightbulb."

— Elizabeth Dissin

The information in this article was compiled from Arcosanti: An Urban Laboratory?, Arthur Frommer's New World of Travel 1988, Science Digest *(March 1981) and brochures supplied by and with permission from Arcosanti, in addition to a tour by the author.*

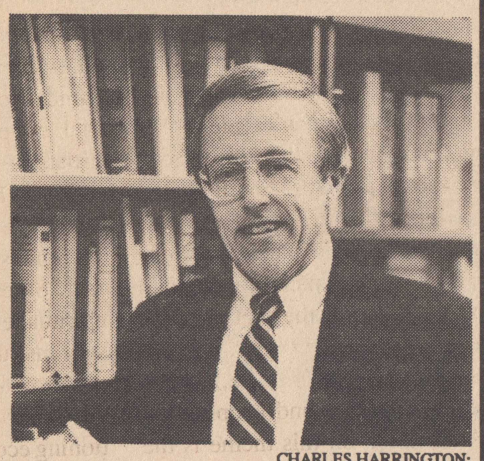
For further information write to Arcosanti, I-17 at Cordes Junction, Mayer, Arizona, 86333, or call (602) 632-7135.



Arcosanti

IVAN PINTAR; Courtesy of Arcosanti

Cornell Course Examines Religion, Ethics and the Environment



CHARLES HARRINGTON; Courtesy of Cornell University Photography

Professor Richard Baer

Nowadays, many people believe humankind should take steps to protect the environment. Environmental values seem to be on the upswing in society. And yet, we have a long way to go. Our scientific, moral and cultural resources seem inadequate to the task of formulating more responsible ways of relating to the earth. Students at Cornell in Natural Resources 407, "Religion, Ethics and the Environment," are exploring these resources and assessing the potential for new directions.

Does the desire to protect the environment reflect opinions and feelings that are merely personal and subjective, or can environmental values be objective moral propositions? What effect has the Judeo-Christian tradition had on the environmental crisis? Is university education the solution, or part of the problem? These are the kinds of questions students in Natural Resources 407 are wrestling with.

The course is taught by Professor Richard Baer, a theologian and historian of religion by training, and an environmental philosopher by inclination. Baer believes that two major and related intellectual problems plague discussion of environmental values.

First, the widely held view that all value judgements are purely subjective opinions which cannot be discussed rationally and judged good or bad, right or wrong, is profoundly mistaken according to Baer. He points out that if one holds this view, all one can say to the Mother Theresas and Martin Luther Kings of the world is "Hurray!" and to the Hitlers and Bothas only "Boo, Hiss!" When we make judgements about moral issues like the advancement of civil rights or the dismantling of apartheid, we are making "objective" claims about right and wrong, not just "subjective" statements about how we feel. Similarly, we may be able to discuss value judgements about the environment as objective judgements rather than merely personal opinions.

Second, Baer critiques the popular notion that the only true knowledge humans have is that knowledge derived from the "facts" established by science. People in modern western societies tend to think that the educated mind should always withhold belief from and doubt any proposition until it is proven. On this view, knowledge requires certainty. In Natural Resources 407, students begin to challenge this view. We actually know very little with absolute certainty, but we nonetheless have good reasons for believing many things we are not certain about. In fact, we are often more sure about moral propositions, such as "slavery is wrong" or "it is wrong to torture a person just for the hell of it" than we are about many scientific propositions, such as "space is curved" or "continents drift."

The problem with radical skepticism is that it cuts us off from much of the human endeavor. If "doubt until given proof" is a correct philosophical attitude and the proper method for determining what constitutes knowledge, virtually all of art, literature, philosophy and religion can no longer be viewed as knowledge, but only as the expression of opinion and personal feeling. This attitude, of course, would also cut us off from these disciplines as resources for constructing environmental ethics. This would put us in a real bind. If, for instance, we cannot scientifically prove the importance of protecting some species or habitat, why should the average person come to believe that society and government should extend that protection?

Natural Resources 407 shows students how they can make legitimate arguments for environmental preservation on aesthetic, moral, philosophical and religious grounds. The course begins with an examination of how human attitudes towards the natural world tend to be very utilitarian. Nature is commonly seen as something to be used. Indeed, much teaching in modern universities encourages this view.

The course quickly moves into a discussion of the nature of discourse in science, ethics and religion. The questions considered are many. What is a fact? A value? What is objectivity? What is knowledge? How people in scientific, moral and religious communities actually talk about and decide the validity of propositions is examined. Particular attention is given to religious discourse, a subject that students at Cornell seldom get to examine. The course focuses on the traditions of Christianity and of Judaism, as this is the area of Professor Baer's expertise and the religious heritage of most Americans.

As Natural Resources 407 moves into the second half of the semester, students examine cultural aspects of the environmental crisis. How have modern tendencies such as reliance on technology, belief in the goodness of economic growth, geographic mobility and the specialization of research and knowledge contributed to our present predicaments?

Three approaches to environmental ethics are then considered. These are anthropocentrism, which views the preservation of nature as part of peoples' responsibility to other people; biocentrism, in which respect for the inherent worth of all species is central; and theocentrism, the view that humankind is the steward of God's creation. The strengths and weaknesses of each approach are studied.

Throughout the course, the emphasis is placed not on determining a single correct view of environmental ethics, but rather on examining

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ENVIRONMENTAL LITERACY

A New Requirement in University Curricula

"In this day and age, no education is complete unless it establishes literacy in environmental issues. Where the environment is concerned, the actions of individuals are the biggest part of the problem, and therefore must be the biggest part of the solution. We must prepare students to go beyond advertisements and beyond political rhetoric: to make their own decisions about what to buy, what to do, how to live.

"We therefore ask that Cornell officially adopt *Environmental Literacy* as one of the goals of undergraduate education. This goal can be achieved in a variety of ways, not necessarily through massive new requirements. We support Cornell's current efforts to strengthen and expand the environmental curriculum and ask that Cornell make these courses available to all students."

This is how the Cornell Greens' petition for Environmental Literacy at Cornell reads. They, and students working along similar lines at Syracuse, are inspired by Tufts University's Dean of Environmental Programs, Tony Cortese. His office, the first of its kind at a major university, has proposed to make all Tufts graduates "environmentally literate." That is, they should "have a basic understanding of environmental health and natural resource protection issues in the context of meeting basic human needs." To quote his proposal further, Environmental Literacy would include:

- Basic understanding of the biosphere—the air, water and land—as the life support systems on which all living organisms depend for habitability and survival.
- An ecological perspective of nature and human beings including concepts of carrying capacity, adaptation and evolution.
- Historical perspective on environmental changes caused by nature and human society with special emphasis on the rapid changes brought about by industrialization, urbanization and population growth since the mid-19th century.
- Understanding the difference between hazard and risk and between actual, potential and perceived risks from contamination and destruction of the environment and natural resource consumption.
- Basic understanding of how the ways in which we organize ourselves as family, community and national entities and choose to meet human needs and wants effects health, the environment and quality of life. Exploration of how culture, social and political organization and the stage of development of groups of people contribute to these effects.
- Exploration of ethical issues involved in environmental protection and management including: 1) distributive justice and moral issues surrounding science, technology and human organization and activities; 2) the intervention strategies utilized to manage and protect humans and the natural environment; 3) the judgments and decisions of environmental management professionals.
- Exploration of decision-making on environmental issues in scientific, economic, legal, social and political contexts, and concepts of decision-making in the face of scientific and other uncertainty.
- Awareness of how individual decisions affect the health and quality of life of other people and living species, and actions that individuals can take to protect the environment and public health.
- Awareness about the sources of information and expertise on environmental issues. Ability to read and understand newspaper articles on environmental issues. Sufficient skills to engage in scientifically informed discussions on environmental issues in the communities individuals live and work in.

How can universities achieve these goals? At Cornell, the Greens have proposed the following:

> *Where the environment is concerned, the actions of individuals are the biggest part of the problem, and therefore must be the biggest part of the solution.*

"As a start, environmental science courses should qualify as fulfilling science distribution requirements, so that students have a better opportunity to take them. The College of Engineering currently encourages students to take courses concerning the social issues related to their field; this should be expanded.

"In addition, although there are many competing topics for the curriculum, a good argument can be made for an environmental requirement. This could be arranged in the following manner: if a list of environmental courses that fulfilled various categories of the distribution requirements were compiled, it could be required that the student take at least one in the course of completing his or her distribution requirements. This way, the actual number of courses each student has to take would not increase.

"The departments that teach these courses will need more TA support as their enrollment increases.

"Finally, the Administration should support the efforts of the various departments to get together and form a highly visible Environmental Studies Program. Many undergraduates feel lost between Natural Resources, Environmental Engineering and other programs."

In addition, students are calling for the creation of new courses, and the use of environmentally relevant examples in introductory courses in science, sociology, political science and even literature.

There are many other roles an office like the Dean of the Environment could play. For instance, it could support and coordinate educational programs, seminars, etc. Often seminars and educational programs which concern environmental issues go unpublicized to those in the community who are interested, and are instead attended by a few graduate students and faculty in the field. These events should be better

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Call to Consciousness and Action

EarthYear 1990 is a consortium of campus departments and organizations focusing on and promoting environmental issues through events and action.

Learn about upcoming events and activities in the EarthYear 1990 Newsletter, the EarthYear calendar, and various local papers.

For more information, contact Robin Tait, 470 Hollister Hall, 255-8578

'90 EARTH YEAR AT CORNELL

SEAC

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like Greenpeace, the Sierra Club and so on—and the grassroots community organizations fighting toxics, incinerators and nuclear dumps in their towns and counties. SEAC provides a bridge between all these groups to create a more unified and powerful environmental movement. Finally, SEAC sponsors actions and campaigns on a national scale. So far, it has sponsored four major campaigns:

✡ Minimum Impact Campuses. Immediately after the Threshold conference, students on 150 campuses presented proposals to their administrators on how their campuses could and should improve their use of resources, and thus greatly reduce the damage they do to the environment. These proposals included energy conservation, recycling, and the use of unbleached, recycled paper.

✡ Marches for Environmental Justice. On February 26th, simultaneous marches in 35 state capitals were held for Environmental Justice. Between 5,000 and 10,000 students attended in all. These marches concentrated on whatever issues were pertinent to that state (for instance, in New York protesters marched against a low-level nuclear waste dump and against development of the Adirondacks), but all had a common theme: the right of every living thing to a clean and healthy environment. Prominent in the abuses of this right in this country is the misconduct of America's Forest Service (see next).

✡ Save America's Ancient Forests. The American public is slowly coming to the realization that our own ancient, native old growth forests represent a heritage as rich and unique as Brazil's tropical rainforests, and are just as threatened. Our own tax dollars subsidize a logging industry that is destroying irreplaceable public lands in the name of short-term profits, and our Forest Service has become completely dominated by industry interests. American labor is suffering as the industry replaces forests with mechanized tree farms, and raw logs are shipped to Japan to be processed. Through the February 26th march and coordinated letter-writing campaigns throughout the year, SEAC has supported the Tongass Timber Reform Act and the Native Forest Protection Act of 1990. These acts would save what little is still left of our nation's ancient forests.

✡ Clean Air. On April 2nd, SEAC held a National Student Action for Clean Air in Washington; 350 students from 45 states attended to rally and lobby their representatives for stronger Clean Air Act. The consensus of the students there was that the Senate bill does not deserve its name. SEAC called for a *real* Clean Air Act that would move towards zero emissions of toxics and pollutants, ban incineration and the introduction of new toxics, ban CFCs by 1993, raise fuel efficiency standards, provide Federal support for mass transit and give communities veto power over the siting process of factories, incinerators and dumps.

As SEAC grows and matures, it is starting to evolve a national decision-making structure and a funding base. It is committed to remaining a democratic group, combining the best of the grass roots and the sophisticated lobbying organizations.

Get in touch with SEAC! Connect it with environmental groups in your area. Help it grow and define itself.

— Cris Moore

For more information on SEAC, call: Cris Moore (New York State coordinator) at (607) 253-1544; National office: (Chapel Hill, North Carolina) at (919) 962-0888 or 962-2333.

Recycling & Waste Reduction

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has tripled in the past 15 years! Fortunately, however, the breakdown of the waste stream is somewhat encouraging. Recyclable products make up the majority of our waste. Glass accounts for 8.2%, plastic for 6.5%, and, most importantly, paper for 41% of American waste. In fact, the largest single component of solid waste in landfills, accounting for 14% of all landfill space, is newspaper. Although the solid waste picture is grim, these statistics on recyclable materials offer the ray of hope needed to pull us out of this crisis.

In order to deal with this problem, each American must learn to change everyday habits. We must reduce the amount of waste we produce, reuse whatever materials we can, and recycle whenever possible. Reducing your waste stream is easy. Consider all the simple things you do everyday that produce unnecessary garbage. Now change them! Stop taking bags at stores if you're just purchasing a small item, or start taking your own shopping bag with you when you shop. Try to reduce the amount of disposables you use. One easy way is to carry a reusable mug with you; every time you purchase a beverage, use your mug! Use an entire sheet of paper (both sides), especially when photocopying. Use cloth napkins, rags, and diapers. Buy products in bulk to reduce the amount of packaging you use. Consider using rechargeable batteries. Use a real razor, or perhaps an electric razor, instead of disposables. Buy a reusable pen. Buy ice cream cones instead of cups! Make sure to return aluminum cans and glass bottles (in many states you receive a 5¢ refund), and collect them from public areas whenever possible. Finally, investigate ways to use less water, electricity, and oil. Walk, ride a bike, or take a bus instead of driving. Each of these changes will help, but this is not a comprehensive list. Use it as a starting point to think of your own ways to reduce your waste stream.

Next, find ways to reuse things before they enter your garbage. Wash and reuse glass, plastic containers and aluminum foil. Reuse plastic bags. Give old clothes and furniture to your local charity, or have a garage sale. Donate books and magazine collections to local libraries. In general, look to mend and repair rather than discard and replace.

Americans should make an adjustment in their lifestyles towards both recycling any materials we can and buying recycled products. Considering the fact that more than 50% of our waste is recyclable, we should be able to put a large dent in the solid waste stream through recycling programs. If there isn't a recycling program near you, consider starting one. If there is, find out what you can recycle. Most programs accept paper, including regular white paper, colored paper and newsprint. Many also recycle cardboard, both clear and colored glass, aluminum and sometimes tin. Get in the habit of separating your trash and recycling whatever you can.

Recycling only works if we also *buy* recycled products. Recycled paper products now include: notebooks, stationary, envelopes, computer paper, greeting cards, wrapping paper and more. Send your friends a letter on recycled stationary. Encourage family, friends and especially *merchants* to use recycled products. The bigger the market for recycled products, the better!

These three main techniques (reduce, reuse, recycle) are simple ways we can start to change our habits. There are other things we can do to combat America's solid waste problem, including composting our yard and food waste, but these three alone could drastically change our garbage's composition. Remember that this list is only a beginning. The main point is simple: each individual must do what he or she can *every day* in order to solve this problem. The solid waste crisis must be faced not just on Earth Day, but every day.

— Scott R. Peppet

For more information susbcribe to: Garbage: The Practical Journal for the Environment, *435 Ninth Street, Brooklyn, NY, 11215-9937.*

Valuing Biodiversity

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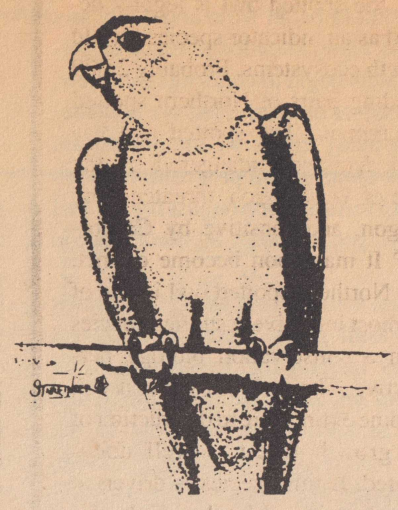
is still produced primarily from rubber trees in tropical forests, where it was discovered. This one industrial product alone accounts for more than $1 billion in imports each year. Like pharmaceutical companies, industries are always searching for and finding useful substances that occur naturally.

No one can know what potential applications exist for natural substances that we have not yet discovered, or future uses that we have not yet developed. We will also never know how many useful natural substances and chemicals have been lost through the mass extinction that we are in the process of causing. What we do know is that by saving species, we are also saving contributions to human welfare.



Carolina Parakeet, now extinct.

The great number of direct benefits that species provide for humans does not mean that this is their only value. Species hold intrinsic value. Many species are beautiful and inspirational. Few of us could imagine life without some of our more common bird or tree species. We are also deprived of the sight of flocks of Passenger Pigeons or the sounds of Carolina Parakeets, as well as other extinct species that were once common in the U.S.

Many people also feel that species have value independent of their instrumental value to humans. Species are ends, not means, and as such require no justification. Still others see biodiversity as the creation of God, and thus sacred. Either view would make it not only unwise but also immoral to cause the extinction of even a single species. Biocentric arguments such as these are as convincing, if not more so, than anthropocentric arguments in favor of species preservation.[6]

In the ten minutes that it probably took you to read this article, about one thousand acres of tropical forest have been cut down. With it about ten species have probably gone extinct. Chances are they were insects or plants, but we will never know because chances are that no one has ever seen them before. Ten more life-forms, unique, useful and beautiful in their own ways, have come to the end of their millions of years of existence in a matter of minutes. Is it worth it? We may be able to explain it to ourselves, but are we prepared to explain it to our grandchildren?

— Mark Urbanski

1. Bryan G. Norton, *Why Preserve Natural Variety?* (Princeton: Princeton University Press, 1987), 156.
2. "Nearly Extinct Mint Plant Produces an Insect Repellent, Scientists Find," *The Cornell Chronicle* 21; (January 1990); 1+.
3. Marjory L. Oldfield, *The Value of Conserving Genetic Resources* (Sunderland: Sinauer Associates, Inc., 1989), 91.
4. Norman Myers, *A Wealth of Wild Species: Storehouse for Human Welfare* (Boulder: Westview Press, 1983), 106-7.
5. ibid., 146.
6. For a more detailed discussion of the biocentric point of view, see Holmes Rolston, III, *Philosophy Gone Wild* (Buffalo: Promethius Books, 1989); Roderick Nash, *The Rights of Nature: A History of Environmental Ethics* (Madison: University of Wisconsin Press, 1989); Paul W. Taylor, *Respect For Nature: A Theory of Environmental Ethics* (Princeton: Princeton University Press, 1986); and Aldo Leopold, *A Sand County Almanac* (New York: Oxford University Press, 1949).

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Old Growth Forests

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"If properly managed and operated under a free enterprise system without unfair competition from subsidized timber sales from public lands, [the private forests] are capable of producing all the wood products the nation requires for its domestic market in perpetuity."[1]

History of logging on public lands

"Before World War II, very little logging was done on national forest land. But as the last of the big trees disappeared from private land, attention turned to the reserves, set aside 100 years ago, as a source of the industry's wood supply. In the last 3 years, a record number of trees have been cut from the national forests, more than 12 billion board feet a year, or triple the number of a a generation ago.

"In the Pacific Northwest, where almost half of all logging on national forests is done, the Forest Service has cut the oldest and biggest trees first and replaced them with new trees.

"In the early 1980s, John B. Crowell was the Assistant Secretary of Agriculture in charge of the national forests. Mr. Crowell said one of his main goals was to speed logging of the 3 million to 4 million acres of original forest left in the West. That policy is now under review, Mr. [Dale] Robertson [current head of the Forest Service] said.

"Since the mid-1980s, the last of the old growth has been cut at a pace of about 70,000 acres a year. Most national forests in the northwest are now laced with roads and clearcuts."[2]

The Forest Service has done a review of all the remaining lands that are potentially available for wilderness protection, and has decided that almost all areas with extractable resources would not receive such protection. According to Dave Foreman, "In the big tree state of Oregon, for example, only 370,000 acres were proposed for wilderness protection out of 4.5 million acres of roadless, uncut forest lands." Areas with extensive old growth forests were slated to have roads cut through them in preparation for logging. "In most cases the damaged acreage will be far greater than the acreage stated because roads are designed to split areas in half and timber sales are engineered to take place in the center of roadless areas, thereby devastating the biological integrity of the entire area. The great roadless areas so critical to the maintenance of natural diversity will be gone. Species dependent upon old growth and large wild areas will be shoved to the brink of extinction."[3]

Importance of Old Growth Forests to Science

From a scientific perspective, all remaining U.S. forestlands need to be protected for their biological resources. Biological diversity includes individual species and the ecosystems in which they live. Destruction of habitat is the primary cause of loss of biological diversity; to preserve biological diversity, large undisturbed areas must be left in their natural state. Genetic information contained in species constitutes the largest storehouse of knowledge on earth. This information contains instructions for surviving in an environment,for example, how to synthesize chemicals. Many medicines in use today are obtained from the extraction and laboratory synthesis of chemicals generated by organisms. The extraction of parts of DNA of living organisms will be increasingly used for biological synthesis of important chemicals. Because the number of studied species is only a small fraction of the total on earth, great potential for future discoveries exists if species survive the current period of human-caused mass extinction. In addition, the ecosystems themselves comprise active regulating elements of the global environment, altering atmospheric composition and climate.

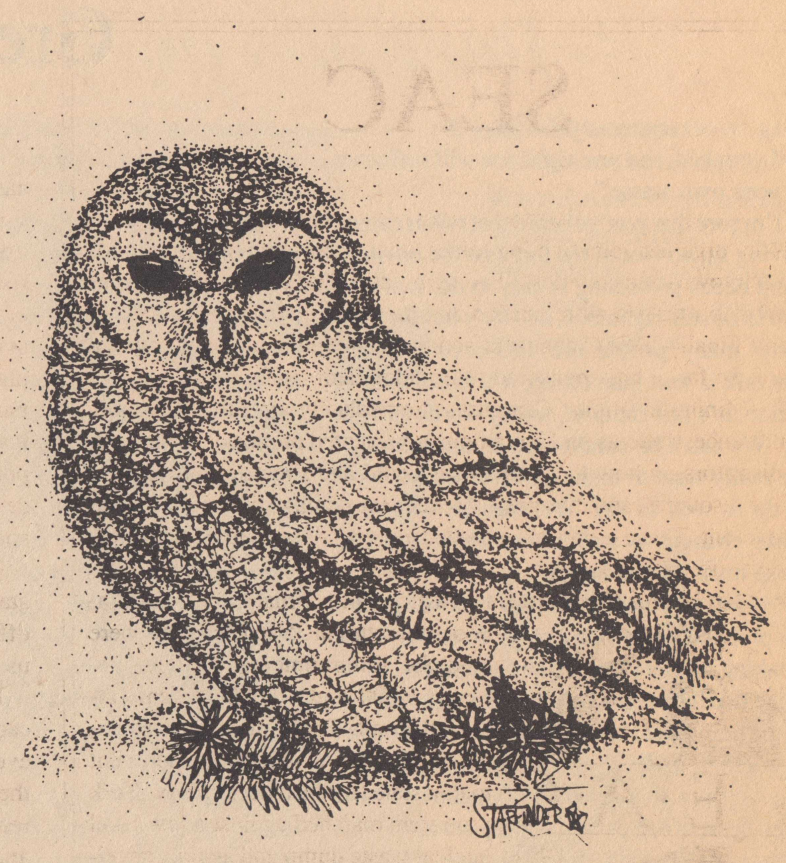
Old growth forest, one of the most complex temperate ecosystems on earth, is a haven for thousands of species of plants and animals. Logging, particularly clearcutting, places those species living in the habitat at risk. Cut forests are often converted to tree farms which do not have a fraction of the biological diversity of the ancient forest. Chris Maser, former BLM biologist, calls tree farms "ecological deserts." Sixty-four vertebrate species which use the coniferous forests of Oregon and Washington as their primary habitat (they depend on the older forests in order to maintain viable populations) have been documented.[4] Undoubtedly, thousands of microorganisms unique to old growth forests will be found in the soil. The population of top carnivores in an ecosystem is a good indicator of the overall health of the ecosystem. In this context, the issue of whether the Northern spotted owl should be listed as an endangered or threatened species is understood to be a decision affecting the entire old growth ecosystem. Under the National Forest Management Act, the spotted owl is legally defined as an indicator species for old growth ecosystems. Probably 2,000 breeding pairs of Northern spotted owl remain. The spotted owl has been declared endangered by the state of Washington, threatened by Oregon, and sensitive by California.[5] It may soon become extinct. The Northern spotted owl is one of the most intensively studied species from a conservation biology perspective. The possibility that it will become extinct due to destruction of old growth forest is well documented. If this species is driven to extinction it will be the result of a conscious and deliberate decision.

The scientific process which is legally required to consider only biological status in making listing decisions was subverted by corrupt public officials who are heavily under the influence of the timber lobby. A report released by the U.S. General Accounting Office concluded that the Fish and Wildlife Service (FWS) improperly reached its decision denying the petition to list the spotted owl as an endangered species. "The petition study process was delayed and, as a result, failed to thoroughly address information potentially crucial to the owl's condition. The peer-review study team report was substantively altered to make it more suitable for supporting a no-list decision. Finally, while the decision-making process was largely undocumented, the official who made the no-list decision told us he decided to deny the listing petition at least partially in response to a belief that top FWS and Interior officials would not accept a decision to grant the petition. These problems raise serious questions about whether FWS maintained its scientific objectivity during the spotted owl petition process."[6]

Rolf Wallenstrom, the fired regional director of the FWS, told the *Oregonian* that the chief of the U.S. Fish and Wildlife Service, Frank Drake, and former Interior Secretary Donald Hodel gave him "pretty obvious" signals last year that the owl should not be listed as an endangered species. Wallenstrom said the chief opposition came from James Cason, head of the U.S. Bureau of Land Management and an Assistant Secretary of the Interior. Cason, he said, "told me he didn't want to see it listed."[7]

The FWS is to reissue a ruling on the listing of the Northern spotted owl on June 24, 1990. Most biologists agree that the best way to ensure the owl's survival is to protect all remaining old growth forests.

Along with the owl, potential natural products from old growth trees would be lost. An example is the Pacific yew, a shade-tolerant tree very closely associated with old growth, whose bark is currently being tested as an anticancer drug by the National Institutes of Health.[8] A reservoir of carbon contained in the forest's biomass would also disappear. Measured by biomass per area,the northwest ancient forests are the richest in the world, containing an average of 708 tons per acre, 4 times that of an acre of tropical rainforest.[9] The carbon is retained over climatically significant timescales; the forests are over 6,000 years old. The clearcut logging practices in the Pacific Northwest contribute roughly 40% of the total carbon dioxide (CO_2) emissions in the region. With the possibility of global warming due to increased amounts of "greenhouse" gases such as CO_2, the logging of these ancient forests is very unwise indeed.



Northern spotted owl

The clearcutting and burning of unusable timber (about 40% of the timber) destroys most of the organisms in the soil and sets the stage for massive soil erosion. The forests are crucial to the watershed, as 3% of rainfall in an intact forest is lost to runoff, while in a clearcut area 60% of rainfall is lost to runoff. With that runoff is carried soil, which clouds and chokes streams with sediment, killing fish eggs and fry. Deforestation needs to be stopped in the U.S. now as a prelude to addressing the more difficult problems of global deforestation and global warming.

Economics of Logging

Economically, the logging of the ancient forests in the U.S. constitutes a huge embezzlement scheme in which the U.S. taxpayers contribute more than $1 billion a year to pay the U.S. Forest Service and BLM to prepare the forests for logging by timber companies. The timber

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Green Philosophy

continued from page 3

soil your bed, and one night you will suffocate in your own waste."

I'm sure that you've heard that talk is cheap. Giving lip service to the fact that the environment needs protecting is easy to do. It allows you to be self-righteous, and let's face it, *right* (how many people are anti-environment?) But talk is less than cheap, it's free. Without action, it's just rhetoric, empty words and hot air. We can't be conditional in our values. If we really want to make a difference, we have to do as well as say. We must be willing to make changes as well as sacrifices, and yes, these must start at home.

Fortunately, we have many lists and guides for practical things we can do, from recycling to taking shorter showers. Unfortunately, while these small changes help to reduce the effects of the ecological crisis, they don't do enough to address its causes. The changes that we make in our lives must be fundamental and deep-seated. We cannot simply react to problems made obvious, like a shortage of landfill space or potential drought. Solutions must root themselves in an ecological ethic that changes the way we look at the world; a proactive view before a problem arises that recognizes the need for restraint even in the presence of apparent surplus.

Environmental movements of the past have rarely addressed the societal problems that lie behind our environmental woes, and have rarely offered solutions beyond criticism. What resulted is the "top-down" approach to conservationism we see in bureaucracies today. Rather than seek alternatives to the products that create pollution, we determine standards for the amount of pollution we think we can tolerate. We set limits on the number of wetland acres we can pave rather than try to create an ethic that would view the destruction of an ecosystem as inappropriate and senseless.

Some say we've entered a new age of environmentalism; that we're getting a second and perhaps final chance to save that which we care so much about. Time may be running out. Can we afford to repeat the mistakes of our past? It seems that this new age calls for a new perspective; one that believes we can create a sustainable society in which all humans, plants and animals can live in respectful cooperation with one another.

Green philosophy seeks to identify the changes we need to make in our lives. The Green alternative offers a new paradigm. Green is not a new religion or religious cult. It isn't a group of radical leftists or reactionary rights. "We are neither left nor right, we are in front" write Spretnak and Capra in *Green Politics*. Simply put, Green philosophy is a framework for living. Green philosophy may not be for everyone, but it doesn't claim to be. It doesn't present dogma that we must accept blindly or doctrines we are obligated to embrace. It merely raises questions that are intended to open eyes and change perspectives.

Green thought is guided by a long term vision for the future. Its principles traditionally have been condensed into what are known as the four pillars: ecology, social responsibility, grassroots democracy and nonviolence.

Ecology

Green ecology has aspirations beyond maintaining or repairing the status quo, which has generally been the goal of environmentalism. It "encompasses the study of nature's subtle web of interrelated processes and the application of that study to our interactions with nature and among ourselves." Its teachings "include implications for our politics, our economy, our social structures, our educational system, our health care, our cultural expressions, and our spirituality." It is the first pillar of Green thought and perhaps the cornerstone. It encompasses the three others in that it recognizes that all things are connected and that to repair our relationship with the earth we need must find a way to simultaneously repair our relationship with our community, with our families and with ourselves.

Social Responsibility

Most Greens understand social responsibility to mean "social justice" and an assurance that the poor and working class will not get hurt by programs restructuring the economy and our consumer society to protect the earth. In the past, environmentalists have been labeled as the privileged elite, as the well-to-do leisure class that wants to preserve recreation areas regardless of the burden this may impose upon working people. Environmentalists that insist on the closing of a mine or a paper mill without considering employment opportunities for those who lose their jobs may not be exempt from this criticism. Greens try to recognize that there is always another side to an environmental problem; the human side. People cannot be left out of the equation, they are part of the land's community.

Grassroots democracy

Greens feel that direct, participatory democracy is the best way to affect change. Most Green groups work on the local level attempting to influence town or county officials rather than national policy. "When people do not live where they work, they do not feel the effects of what they do. The people responsible for strip-mining, clear-cutting of forests and other ruinations do not live where their senses will be offended or immediately threatened by the consequences" observes Wendell Berry in *The Unsettling of America*. Greens envision a future in which decisions that effect local economies, societies and ecosystems will be made by local people. They recognize the need for central authority in some cases, but where it is practical and efficient to do so, Greens wish to restore power and responsibility to local regions.

Nonviolence

Nonviolence means to Greens the cessation of personal and structural violence against things both living and non-living. Greens generally advocate peace education in schools and an end to violence and oppression against women, children and minorities. They seek an end to the threat of nuclear destruction without being blind to the interest of governments. "They want to transform our violent relationship with nature into one of balance and respect," says Petra Kelly of the West German Greens. "Nonviolence is the essential ingredient in an ecological society."

Greens strive to look at the big picture. Rather than adamantly oppose the building of a dam, they try to first find the motivations behind its construction. They don't just point accusatory fingers at corporations or developers but instead recognize that they themselves create markets and only responsible changes at the individual level will compel these institutions to act responsibly. They support the preservation of wild places too, because after all, wilderness is a significant part of any culture. Above all, Greens realize that there are no easy answers; that no environmental problem has a simple solution, and that each has causes and effects relative to human needs and must be addressed in this light. Said Aldo Leopold in 1949, "No important change in ethics was ever accomplished without an internal change in our intellectual emphasis, loyalties, affections and convictions." Say Green thinkers in 1990, "Green consciousness isn't just acid rain and toxic wastes, it's the food you put on your table and the games your children play."

— Jennifer M. Parody

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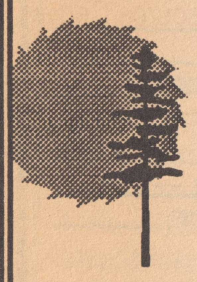

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CFC Legislation in Vermont

continued from page 4

100 years and the chemical was first produced in the 1950s, then not too many of either have yet to decay and have not yet exerted their full effect.

The law does not make provisions for banning anything other than CFCs and halogens in fire extinguishers, so HCFCs are technically legal. The Vermont Public Interest Research Group is seeking an addendum to the law that imposes the same restrictions upon any chemical that is shown to have ozone-decaying characteristics. Mulhern is fairly confident that the amendment will eventually be passed, although industry could once again put up a struggle.

Styrofoam with CFCs has not yet been eradicated from the state, as it's considered economically integral and useful in too many items to ban immediately. The law is not the end of the legislative action against ozone-decaying chemicals, however. Alternatives to Styrofoam will probably be proposed on a case by case basis for each specific industrial or market use. In addition, industry research is being authorized by the Vermont Agency of Natural Resources to find safe quality substitutes for all displaced, soon to be CFC-less products.

You're not helpless in supporting this issue. As Vermont legislators hope that the bill will be mimicked by other states and perhaps even the Federal government, students can take individual action to help prevent further unnecessary depletion of the ozone layer. First, exerting market force by attempting to avoid Styrofoam and aerosol products containing CFCs and investigating the absence or presence and relative level of CFCs in a new car or refrigerator, one can send less consciencious businesses the message. Another effective aproach is a quick letter to your state representative, senator or their counterparts in the Federal government. Simple consumer awareness and citizen lobbying will go a long way toward halting the proliferation of destructive CFCs.

— Jeff Lamontagne

Environmental Literacy

continued from page 9

advertised to the community at large; this is also an excellent chance for the Administration to work with student groups.

Many different branches of the University and the Administration are typically involved in environmental reform. A Dean's Office could coordinate these pursuits. In addition, it could take a general responsibility for the environmental well-being of Cornell and could handle complaints and inquiries regarding environmental concerns.

ACTION

Make Environmental Literacy and/or the establishment of a Dean of the Environment one of your focuses for on-campus reform. Contact Andrea Sultana at Cornell (607) 253-8447, Robb Zide at Syracuse (315) 423-8450; or Tony Cortese, Dean of Environmental Programs at Tufts (617) 381-3486.

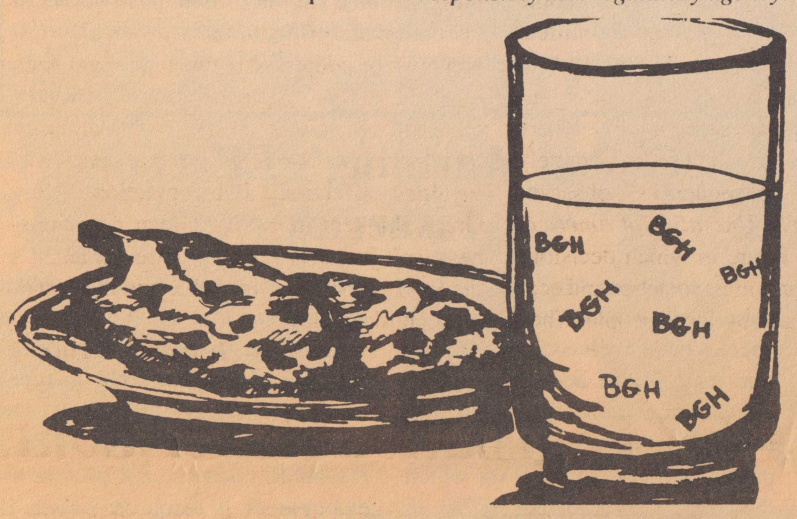
— Cris Moore

Dispelling the Myths about BGH

continued from page 5

tions of BGH and IGF-1, a cell-stimulating growth factor, have been detected by some studies in BGH-treated milk (see next item). Also, data recently leaked from Monsanto's own studies show BGH concentrations *up to 1,000 times higher than normal* in the cow's bloodstream. This will probably show up in the milk. No studies have been done on it, since the FDA hasn't required the industry to do so.

MYTH: Synthetic BGH has no biological effect on humans. This is unfounded. The only study on human health effects of BGH consisted of injecting human dwarfs with *natural* BGH, with no effect; this is irrelevant firstly because it used the natural product, not the synthetic one, secondly because there was no long-term follow-up and thirdly because some types of human dwarfs do not even respond to *human* growth hormone unless it is administered along with androgens. The industry's claim that BGH is species-specific (i.e., that it only affects cows) has now been softened to "species-limited;" in fact, BGH is known to affect goats, pigs, sheep and mice.



In addition, the chemical IGF-1, which some studies show occurs at increased levels in BGH milk, is the same for humans and cows; in particular, there are receptors for IGF-1 in the human breast. This could cause problems for infants and women breast-feeding their children.

MYTH: Even if synthetic BGH is harmful to humans, the milk is harmless since the BGH will be digested rather than being introduced into the bloodstream. This claim is based on the fact that BGH is a protein; however, newborn infants, as well as some adults such as those with ulcers or cystic fibrosis, are capable of absorbing the protein directly. The industry recently admitted that "some proteins are absorbed into the blood stream without being fully digested." In addition, some of the fragments (tryptic digests) BGH can break down into in the human digestive tract *are* known to be biologically active in humans, causing nitrogen retention and other effects similar to the human growth hormone. Monsanto was urged to study this 26 years ago; they have not.

MYTH: Treating cows with synthetic BGH has no effect on their health. A number of studies, conducted by Monsanto and American Cyanamid, showed an increase in mastitis (inflammation of the udder) and other infectious diseases; industry-sponsored research recently published in the *Journal of Dairy Science* showed a significant drop in fertility. Oddly enough, these papers often conclude that BGH has no adverse effects even when their own data suggests otherwise.

If farmers compensate for these effects by giving the cow antibiotics, estrogens and even illegal drugs (as they allegedly have in a number of studies) then there could be secondary effects on the quality of the milk; high levels of antibiotics and sulfa drugs showing up in milk are already a concern to the consumer.

In addition, recent leaks from Monsanto studies show that the cows' liver, heart, kidneys and adrenal glands are all greatly enlarged. Clearly BGH stresses the cow's system a great deal.

MYTH: The FDA has been acting responsibly as a regulatory agency. The FDA is currently under more investigation than any other Federal agency besides HUD. A 1986 Congressional report concludes, "FDA has consistently disregarded its responsibility...repeatedly put what it perceives are interests of veterinarians and the livestock industry ahead of its legal obligation to protect consumers...jeopardizing the health and safety of consumers of meat, milk, and poultry." Last Fall, several FDA scientists admitted to taking thousands of dollars in illegal payments from drug companies seeking approval for their products. Currently, Senator Leahy is investigating FDA's actions where BGH is concerned.

In the "whistleblowing" tradition, an FDA scientist has been fired for complaining that synthetic BGH was being approved too hastily. Richard Burroughs, highly esteemed by his colleagues, alleges that the FDA "has become an extension of the drug industry" and has failed to investigate key gaps in the data provided by Monsanto. FDA lawyers recently threatened Burroughs with legal action unless he agreed to release various data to them.

MYTH: Research on BGH has been carried out in a spirit of free and open scientific inquiry. Virtually all the research on BGH is funded by the manufacturers. Do you ask R. J. Reynolds to research the health effects of cigarettes?

David Kronfeld, one of the original BGH researchers and now of Virginia Tech., has charged that while favorable studies (such as Cornell's) are published promptly and in full detail, unfavorable results (like Mississippi's and Missouri's) are delayed by months and published only as abstracts or summaries. Since publishing his criticisms, Kronfeld has come under a variety of pressures; he has had to decline public appearances for fear that his university would lose industry funding. Even within the FDA, data has been witheld from investigators trying to resolve some of the issues discussed above.

MYTH: The dairy industry needs and wants BGH. The industry claims BGH is good for the farmer and the consumer. In fact, studies suggest that up to 50% of American family farms could be put out of business by BGH. Even if BGH lowers milk prices, these savings will almost certainly not be passed on to the consumer. Large farmers' organizations such as the Farmer's Union and the Grange have taken positions against synthetic BGH, and 75-80% of farmers oppose it. In addition to the economics of the situation, farmers are also worried that consumers will lose faith in milk as a wholesome, natural product if synthetic BGH use becomes widespread.

Clearly more research (preferably independent, publicly-funded research) needs to be done before BGH can be allowed on the market. It is also clear that the FDA is having some serious problems finding the objectivity it needs to protect the public.

Action You Can Take

Thank Senator Leahy for his investigation into the FDA, urge your food sources to reject BGH products, and support label laws and moratoria in your home state.

— Cris Moore

Unfortunately, much of the references for this material is unpublished or in congressional and state testimony. However, a lot of references are given in S. Epstein, "Potential Human Health Issues in BGH", International Journal of Health Services, 20, no. 1; 73-84 (1990).

Letter from Lisa Greber

continued from front cover

funded research subsidize private corporations.

How will this effect our tactics as a radical science movement? Consider the debate around science education. The major concerns of current policy makers are to ensure a sufficient supply of scientists and engineers to meet the country's demands of productivity, "competitiveness" and military preparedness. Educational reform with these constraints can follow MIT President Paul Gray's suggestion offered at a forum last fall: a two-tiered system that teaches some to be technical leaders and provides others with the minimum competency necessary to perform routine tasks.

If instead our concerns are to ensure democracy in a technological society, scientific literacy becomes a necessity for all citizens. Citizens need to be able to distinguish which parts of a decision require technical information and which should reflect our values. For example, risk assessment of a nuclear power plant may be able to provide some sense of the possible consequences of an accident or the routine release of radioactivity as part of normal plant operations. The decision about whether to accept this level of danger reflects our values.

In a similar way, a radical science movement can demand that conversion not simply disentangle science from the military but also from its complicity with more subtle forms of violence. Biologists developing new reproductive technologies in a context where women's rights are under attack must struggle with questions of their responsibilities as surely as those engaged in research in biological weapons. This deeper understanding of conversion will enable us to build a world where we don't have to choose between our science and our values.

Putting Theory into Practice

Science for the People exists to transform these values into reality. Right now, our activities are focusing on science education and conversion.

The Berkeley SftP chapter is currently teaching a class on science and society. In Boston, the newly formed science education group has two projects in the works. The first is an after-school science program for elementary school students. The second is the WATTS program (Women's Access to Today's Technologies). WATTS is designed to teach women technical and science skills in a non-traditional setting. The program will feature a range of classes from auto mechanics to mathematics.

Following the release of the FY1991 Pentagon budget requests, the Boston-based conversion group prepared an overnight analysis of the budget. The group presented a "Welcome to the Twilight Zone" award for the most ridiculous defense department program to the "Island Sun" program. Island Sun, part of the Pentagon's contingency planning for a nuclear war, provides $84 million to develop a convoy of lead-lined tractor trailer trucks to serve as mobile Pentagons following the outbreak of nuclear war. The award received both local and national coverage, including mention on HPR and in *In These Times*.

In May, SftP's DC chapter and the Boston conversion group plan an educational action at the Technology Policy in the 1990s: The Shift from Military to Civilian Technologies conference. The conference is sponsored by Defense Week, a publication catering to the military-industrial complex, and will feature such noted "peace activists" as Edward Teller and John Deutsch.

In the longer term, the group plans to publish an organizing guide to help university-based activists effect the conversion of research to more socially relevant projects. The guide will contain a compilation of social needs-based projects tied to particular research specialties. Activists will be presenting initial plans for the guide at a Boston town meeting on conversion. The Boston event is one of 70 that will be happening around the country on May 2 as part of a movement to bring the question of economic conversion to the local level.

The future of Science for the People will be determined by its members. If you would like to get involved in any of these activities, or have some ideas of your own, contact Lisa Greber, Acting Director, Science for the People, 897 Main Street, Cambridge, MA 02139, (617) 288-2154.

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The Facts about the Greenhouse Effect

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inches during the past 100 years.

Increased publicity on the topic has unsurprisingly caused turmoil in industries that want to plan for the results of a global warming. "Climatic change is a new element of risk and uncertainty," says T.R. Harris, a former Energy Deptartment official, now a consultant with Oxford Analytica. "If you fail to think about it, it could cost you significant amounts of money down the road." As a result, meteorologists suddenly experience a surge of interest in their long-term predictions.

Characteristic is the example of Illinois Central, a railroad company that made $18 million more in revenue two summers ago, because of the 20-foot drop in the Mississippi River's water level. Barge traffic stalled and shippers had to find other modes of transportation. Also preparing to face a drier climate, Weyerhaeuser Co., a lumber and paper company in Tacoma, Washington, already started planting drought-resistant saplings. Similarly, New York state should plan to face a 10% drop in hydroelectric power output with a 1.5°F global warming, predicts ICF Inc. of Fairfax, Virginia.

Skepticism

Unfortunately, scientists cannot guarantee the accuracy of their forecasts. They have used projections of climate theories based on computer models much simpler than the "real world." with access to only very recent records of the earth's past climate. They must separate artificial from natural climate change causes, e.g. volcanic eruptions. They must also account for the time-lag involved in the predicted climate changes. Our oceans will absorb huge amounts of the atmosphere's excess heat and will delay the resulting effects of the greenhouse effect.

The cost of preventive action, as well as the doubts for its necessity, lead some scientists and officials to argue for a delay in taking measures. In this general hesitation, the "negators" have emerged, as the Greek newspaper *The Daily* calls them. "Negators" just look at our environment as a source of investment. They simply don't want to endanger the U.S.'s economic stability based on plain hypotheses. Other skeptics expect factors, such as increased cloud cover, to work as negative feedback mechanisms in global warming. However, attitudes like these could have dangerous consequences. It will be too late for prevention if we wait for the proof.

Prevention

Although we will have to learn to live on a warmer planet with all of its resulting problems, it would give us more time to adjust if we managed to push the predicted 3° to 8° rise past 2030. In the past, climates changed very slowly, giving nature and civilization a chance to react. Yet even those changes "resulted in mass extinction of species that were unable to adapt," acknowledged Robock.

Clearly we have more to gain than lose by slowing down current projected warming rates of about 0.2°F per decade. How do we do that? We slash fossil fuel emissions by 60%! Upsettingly enough, economists forecast emissions to double over the next 40 years, as populations grow and economies expand.

Here are some measures we have to take before it's too late:

Conserve energy in industry, buildings and transportation, with more efficient appliances, lights, heating/cooling systems, better insulated buildings, better and more efficient public and private transportation, etc. The U.S. has used market and tax incentives and federal regulations to reduce energy consumption. However, there is still a lot to be done to reduce waste. The U.S. has the technology to reduce electricity consumption by 75% and oil consumption by 80%.

Decrease dependence on fossil fuels by introducing electric cars in urban areas and iInvesting in renewable energy sources (solar, wind, hydro, biomass and geothermal power). Another alternative is to improve nuclear power as a source of electricity, although it has dangers of its own: low-level radioactive emissions, potential catastrophic accidents, the unsolved problem of storage or disposal of radioactive waste, and possible diversion of plutonium and uranium for nuclear weapons.

Shift to more "benign" fossil fuels—ones that produce less CO_2. Natural gas, for example, emits 1/3 the CO_2 coal does and 2/3 the CO_2 oil does to produce the same amount of energy.

Reduce deforestation.

Eliminate CFCs entirely. (Thus we simultaneously protect the ozone layer from depletion.)

Conservation in developed countries will have the greatest results. For example, the U.S. still uses twice the energy Europe or Japan use to achieve the same standard of living.

Obstacles to prevention

The U.S. and USSR emit about 45% of the world's CO_2. Many poorer countries, unsurprisingly, don't want to pay the price for stopping the greenhouse effect. Their weak economies would barely survive regulations on energy use. China, for example, plans to base its economic growth on the expanding use of coal. Obviously, this could cause problems in international cooperation toward the prevention of global warming. A feasible and equitable solution would be the free transfer of benign energy sources from wealthier to poorer countries.

However, a major part of the problem stems from an inflexibility in the attitudes of developed nations. How can we expect Third World leaders to stop destroying their tropical forests when the U.S., instead of protecting its own ancient forests in the Northwest, builds expensive roads to facilitate the timber industry.

Although optimistic polls show 3 out of 4 Americans are environmentally concerned, I don't see people ready to give up many comforts for the sake of our home, planet Earth. Humans avoid change until they face a crisis, which endangers their existence. They feel that even if they *do* change, they won't save the world. Unfortunately, people selfishly act for their own good, even when it harms the community.

If you are the type of person who has a brighter image of the future, here is a different theory that tries to see things with optimism: Humans, it says, always faced problems of survival, as did all other living creatures. Those problems made species stronger and healthier, through natural selection. In other words, if we take it for granted that many will suffer and starve during the first period of adjustment to the new climate, then those that will survive will be of a better breed (i.e. smarter, or able to live in higher temperatures, etc.). This theory may have some truth to it. However, I believe it is still worth avoiding the crisis. It is such crises that cause poverty, hunger, even wars. Sure, natural selection works in those cases, too, but is the outcome a better breed?

— Samuel Levis

Natural Resources 407

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the diversity of ways that people can approach the development of greater responsibility towards the earth. The course seeks to debunk modern assumptions about science, ethics and religion that prevent robust discussion of environmental ethics. Also, modern materialistic and individualistic tendencies are called into question.

In the final weeks of the course, the problem of diversity in environmental attitudes arises. How can we acheive progress in environmental ethics in a democratic, pluralistic society such as ours? Baer returns to earlier topics. The view that anyone can achieve a totally neutral, universal, Olympian perspective from which to judge all beliefs, as western philosophy has tried to acheive for hundreds of years, Baer suggests, is fundamentally wrong. We are inevitably formed by the historical contexts and languages (linguistic and moral) in which we find ourselves. People in different communities inevitably think differently, but this does not mean we must become moral relativists. People from different contexts can talk together, learn to understand each others' languages and concepts and determine which values they share. Such discourse can provide a basis for common action; to say only that "interests clash" is often to give up prematurely on the possibility of dialogue and the discovery of shared values.

The implication should be obvious. Environmentalists of all types must do more than talk their particular party lines. Progressive conservationists, deep ecologists (biocentrists) and environmentally sensitive theists can and must share together their good reasons for preserving the environment. Moreover, they must expand their discussions and offer their best reasons—which can be aesthetic, moral, philosophical and religious, as well as scientific—to the public at large. Resistance will clearly be encountered, but that resistance must be met with patience, good humor and appreciation for the other's position. Such an approach is conducive to the kind of "learning together" that is essential to democracy, and ultimately to real, long-lasting progress in the effort to live more gently on the planet.

— Richard Pinkham

Global Warming's Effect on Fisheries

continued from page 7

hypothesis, which states that fish species have evolved in such a way that they spawn and release their eggs in a time frame which coincides with the greatest abundance of phyto- and zooplankton on which the larvae feed (Cushing, 1978). In the case of global warming, a dramatic change in ambient water temperatures could conceivably render the fish and plankton cycles out of sync with each other, and have an adverse effect on these fish populations.

These potential effects on fisheries represent only a few of the possibilities which could occur in a global warming scenario. The multitude of variables surrounding any one of these possibilities, and the lack of hard data to substantiate them, make it extremely difficult at this time to make any real predictions regarding what could actually happen to the world's fisheries if climate is significantly altered.

However, it is certainly reasonable to assert that changes in global climate would significantly impact the world's fishery resources, and it is likely that many of these impacts would be negative. Global fisheries form a good illustration of the types of complex interactions that exist between climate and the world's resources. Fisheries also provide an example of a resource which, if adversely affected by climate change, would have direct negative effects on human populations.

The purpose of this article is not to create a "doomsday" outlook, but to illustrate the types of questions that scientists, and therefore policy-makers, will face, and to point out that existing evidence suggests many negative impacts from global warming. Although it is obvious that these issues require further study, it is my hope that study will not displace action to minimize the probable effects of climate change, which would certainly be significant and likely be disastrous.

So the next time you catch yourself wishing for "a little global warming," be careful—you might get what you wish for.

— Judy Landers

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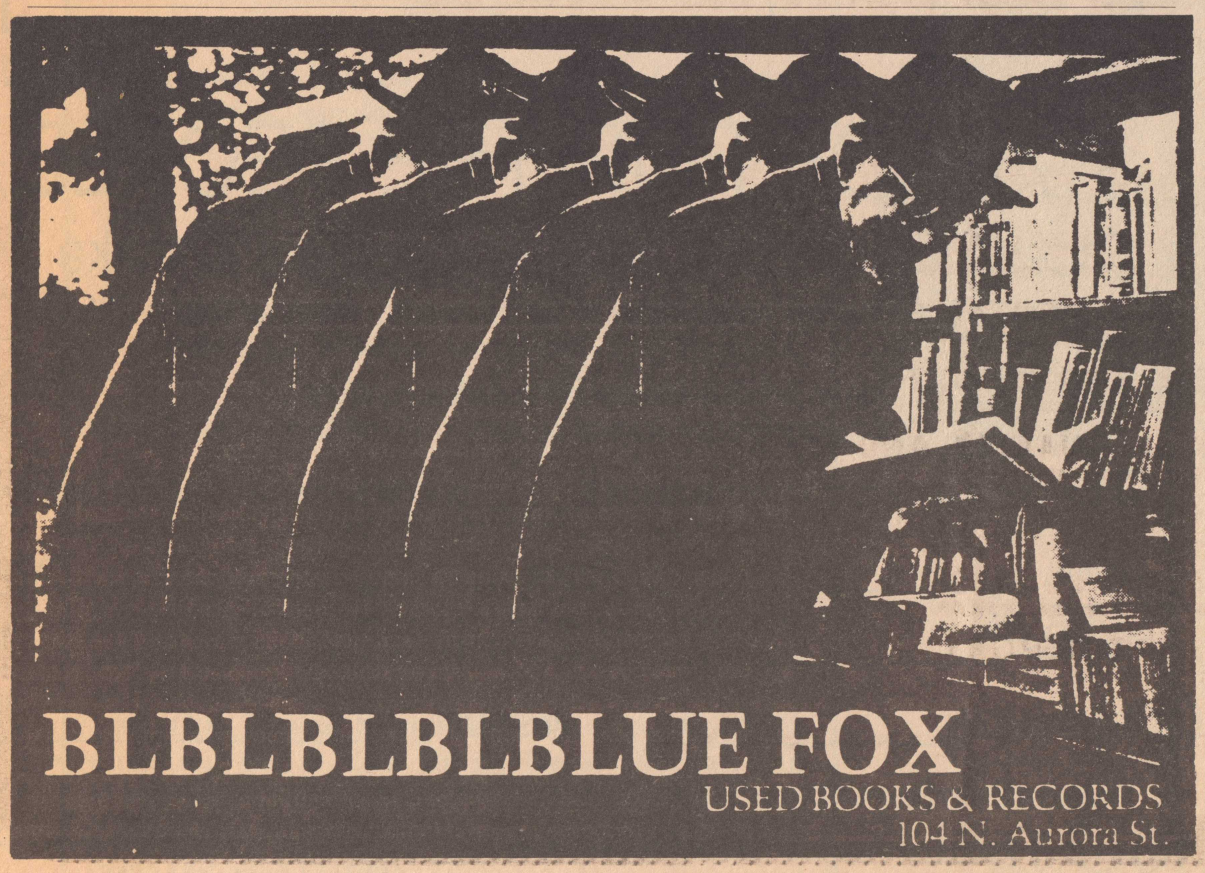

Old Growth Forests

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companies use part of the huge profits to buy political power by "bribing" senators and representatives from the region with large campaign contributions. The indirect costs due to the damage and destruction of ecosystems, watersheds and resulting soil erosion is borne by commercial fisheries, the tourist economy and future generations who will inherit these problems.

According to the Forest Service, expenditures of taxpayers' money by the Forest Service of its $3 billion-a-year budget include over $ 1 billion allocated for timber-related activities and roads. Timber industry profits are estimated at $3.5 billion each year from the logging of old growth forests alone! You can bet the timber industry is going to bring out the heavy artillery if the supply of old growth timber is threatened.

The industry has tried to keep the issue of logging of old growth forests focused on the jobs versus the spotted owl. The facts show that timber-related employment in the region has been dropping due to export of over 60% of all timber in the form of logs or other raw materials and increased mechanization of the industry. Employment in the timber industry decreased by 15% while logging in national forests increased by 28% from 1979 to 1989.[11] Employment in the old growth sector of the timber industry dropped from 65,000 people in 1978 to 39,000 in 1985.[12] At the same time, deforestation damages the tourism and commercial fishing industries. The losses in fisheries are greater than the value of timber harvested. The timber industry has tried very hard to keep the damage to commercial fish catch unassociated with soil erosion caused by their clearcut logging.

The dependence on old growth timber of many small towns in logging districts should be recognized. Economic mitigation to enable them to shift to other sources of income is necessary for any long term solution to the problem. If nothing is done, their economies will collapse when the timber runs out in the next 5 to 10 years.

Proposed Legislation

Each year since 1983 a legislative rider (termed "the rider from hell") mandating minimum harvest levels on national forest lands in the Department of Interior appropriations bill has been passed into law by Congress. The rider is introduced each year by Senators Mark Hatfield (R-OR) and Brock Adams (D-WA) and Representative Les AuCoin (D-OR). The interior department's appropriations bill for fiscal year 1990 (Public Law 101-121) requires that half of all timber cut in the U.S. come from national forest lands. The rider also limits judicial review of timber sales, a strategy which has effectively eliminated successful legal challenges to timber sales which may be violating a host of national laws, such as The Endangered Species Act.

Even though last year the Hatfield-Adams Amendment was almost defeated due to rising opposition, the environmental groups with the largest membership (Sierra Club, Wilderness Society, National Audubon Society, National Wildlife Federation) felt they had no choice but to compromise by accepting the legislation in order to maintain their insider access to Congress. The politics of compromise do not work in the defense of wilderness against the government's subsidized irrational extraction of unneeded and marginally profitable resources. David Brower, former president of the Sierra Club, in a letter to the current president of the Sierra Club says the club needs to make saving the remaining ancient forests a major campain. "Whatever ancient forest is left, and however long it will last, the end is imminent...The plants and animals not yet identified will be put up for sacrifice if the club lets those priceless ancient forests vanish, while the board and staff deliberate, so often behind closed doors, about priorities and black bottom lines."[13]

The Tongass Timber Reform Act (H.R. 987, S.346), would end some of the outrageous abuses in Tongass National Forest. H.R.987 already passed the House. The wording of H.R.987 should be supported because it would declare the 23 key fish and wildlife habitat areas as wilderness. S.346, a bill similar to H.R. 987, would:

- End the unique congressional mandate that the Forest Service supply 4.5 billion board feet of Tongass timber for harvest per decade, and eliminate the automatic $40 million timber subsidy for clearcutting.
- Terminate the 50 year timber contracts currently held by two logging companies and replace them with short term sales like those in all other national forests.
- Place 23 key fish and wildlife habitat areas under a temporary moratorium from logging, until the Tongass forest plan is revised early in this decade.

The Ancient Forest Protection Act was introduced in late March 1990 by Jim Jontz (D-IN) in the House. A compromise bill drafted by the "Big Four" environmental groups is a disappointingly weak act because it would protect about 25% of the remaining ancient forests. The bill doesn't resolve the issue of who draws the lines to decide what forests would be protected, and it probably would only shift the cutting to eastern regions of Oregon and Washington. Completely neglected is the issue of natural growth forests which are not as spectacular as the ancient forests but are important nonetheless.

The Native Forest Protection Act of 1990, which may soon be introduced in Congress, would permanently protect all remaining public forest lands, ending forever the controversy surrounding the management of this precious natural resource. Enormous public support will be required to pass this bill into law. The Act would:

- Declare that all public native forests "shall be maintained as natural, diverse forests, for their broad ecological and environmental purposes, for the long-term public benefit of the nation and the earth's biosphere."
- Direct federal agencies to "prohibit, without exception, any timber sales, cutting or salvage, from such lands, effective immediately."
- Stop all export of unprocessed logs.
- Rehabilitate all previously logged federal forest land.
- Make funds available to assist forest industry workers during the inevitable transition period.

There is a possibility of a sponsor in the House, Representative Robert Marzek (D-NY, 3rd district). Senators Al Gore (D-TN) and Bob Dole (R-KA) are being receptive to it in the Senate. Because this act is so far-reaching, passage will be difficult but could eventually become a permanent solution to the destruction of U.S. public forests.

The ancient forests in the U.S. are almost gone. Ecological indicators are giving the warning signals that the old growth ecosystem is in grave danger. The signals are being ignored by public officials empowered to act in the general public interest even in the face of overwhelming scientific and economic evidence. These officials have been and are betraying the general public's trust. The political influence of the timber lobby has delayed and reduced the ability of the mass media to convey the problem to the general public: the timber lobby is subverting the democratic necessity of an informed public. Additionally, the timber lobby's influence, combined with the general public's lack of awareness, has resulted in prominent environmental groups compromising themselves into ineffectiveness. The U.S. Forest Service is too committed to timber management and has too large a bureaucracy to reform in the time frame necessary to solve the problem. Academia has failed to respond significantly given their level of expertise and the overwhelming scientific importance of the problem. Smaller environmental groups and concerned citizens have been forced to devote large portions of their lives and in some cases to break current laws to do what they know is right: to preserve enough biological resources so that the survival of the human species is more probable. Such groups also know that all species have an inherent right to exist, a cosmic law which transcends in importance not only individual organisms, but also individual species.

There is only one environmental issue: Are we going to live within the the bounds of biological reality, in harmony with nature, or not? We can learn a lot from the wild areas of our planet; how to survive, how to live in greater harmony with nature. The ancient forests are one of those great wild places. Their fate may represent the turning point in the environmental crisis. The time is now to protect all the remaining ancient forests.

Actions You Can Take

- Contact your representatives and urge them to support The Native Forest Protection Act of 1990. (For a copy of the Act contact The Native Forest Action Council, P.O. Box 2171, Eugene, OR 97402, (503) 688-2600.)
- Also urge them to support The Tongass Timber Reform Act, S.346, with the House wording designating 23 key areas as wilderness.
- Encourage environmental groups to act on the ancient forest issue and to endorse The Native Forest Protection Act.
- Consider a boycott of companies involved in the destruction of old growth forests. They include: Weyerhaeuser Company (1-800-525-5440), Georgia-Pacific Corp., Boise-Cacade Corp., Alaska Pulp Co., and Louisiana-Pacific Ketchikan.

— Mike Heinrich

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Duncan, Phil, ed. *Politics in America, 1990 The 101st Congress.* Washington: CQ Press, 1989.
Provides a brief biography of each senator and representative, maps outlining the congressional districts, demographic statistics on each state and a list of the Senate and House committees and subcommittees and their current members.

Washington Information Directory 1989-1990. Washington: CQ Press, 1989.
A well-indexed guide to federal government offices, congressional committees and private, nonprofit organizations in Washington DC with a list of regional federal information sources.

Congressional District Atlas, Districts of the 100th Congress. Washington: U.S. Government Printing Office, 1985.
Provides detailed maps of congressional districts with a breakdown of municipalities and county subdivisions.

State Elective Officials and the Legislatures 1989-90. Lexington: The Council of State Governments, 1989.
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The Windstar Foundation, 2317 Snowmass Creek Road, Snowmass, CO 81654, 1-800-669-4777, for their booklet on recycling.

The Environmental Defense Fund, 1-800-225-5333, for their free brochure *How To Recycle.*

BT&T Associates of Ithaca New York, 710 North Tioga Street, Ithaca, NY 14850, for their free report *Using Recycled Paper: Facts for Business.*

Consumer Products

A few suppliers of environmentally sound products are:

Seventh Generation, Products for a Healthy Environment, Colchester, VT 05446-1672, 1800-456-1198.

Upstate Eco-Logic, 29 Drake Road, Newfield, NY 14867.

Co-op America, 2100 M Street, N.W., Suite 403, Washington, DC 20063.

Information

The above is a very brief sample of possibilities. There are any number of organizations and books which offer tips, information, sources and outlets. Kathleen Gildred for the Transmissions Project of the United Nations Environment Programme has compiled a very useful booklet containing tips and references in the following areas: Water, Toxins & Pollutants, Energy, Waste Reduction/Recycling, Preservation of Life and Environment, Food, Books, Environmental PAC's and Organizations. Ask for the *Personal Action Guide For The Earth*, United Nations Environment Programme, 730 Arizona Avenue #329, Santa Monica, CA 90401.

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To *Science for the People* Subscribers:

We are very pleased to bring you this premier issue of *Beyond Earth Day*. This is the second in a series of special *Science for the People* issues produced by campus activists. These special issues provide an opportunity for SftP to work with campus activists, broaden our visibility and maintain contact with our subscribers while reorganizing the magazine.

The concerns and hopes expressed in these pages—confronting the greenhouse effect, the transition to renewable energy sources and preventing environmental contamination—are ones SftP has struggled with for over 20 years. However, the choice of topics, the analysis, the writing and presentation are all by members of the Cornell Greens.

A Letter from Lisa Greber, Acting Director of Science for the People

I have a confession to make. I am a nerd. I grew up believing I would be a scientist and work quietly in a laboratory. I grew up believing the work I would do was not political.

I was wrong.

We now know that over 65% of the nation's Research & Development budget goes to military projects. We know that corporate support of biotechnology research is limiting the free exchange of research ideas. We know that, at MIT, some graduate students have been forced to sign away all rights to their "intellectual property" as a condition for receiving graduate assistance.

It is time for us, as scientists and engineers, to stand up and say we have had enough. I came to work at Science for the People because I knew the organization shared this commitment. And I came to the organization because now is the time to make change happen. The dramatic upheavals in Eastern Europe provide us with an unparalleled opportunity to demand that our minds and our skills be used to meet our society's real needs for housing, energy and health care and not be wasted on violent toys. We have an unparalleled opportunity to build a radical science movement that will allow the next generation of scientists to work in peace.

A Radical Science Movement for the 1990s

The three main issues a radical science movement will need to confront in the 1990s will be the environmental crisis, the conversion of scientific research from military to civilian needs and the future of science education. these are all areas where there is now broad general agreement that change is necessary. Our task as a radical science movement will be to insist that changes will not simply be bandaids that permit us to muddle along a bit further, but instead reflect a commitment to social justice. The decade of the environment, for example, will mean little if we simply incorporate minimal ecological constraints into current corporate structures.

As we debate how to convert research facilities or what scientific literacy means, our fundamental commitment must be to ensure that we create the necessary preconditions of choice, for democracy, in a technological world. We don't have a democracy if a substantial portion of our population doesn't know what an atom is but needs to decide what kinds of energy to use. We don't have a democracy if only a limited number of technically elite people have a right to decide where to put research funds. We don't have a democracy if publicly

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